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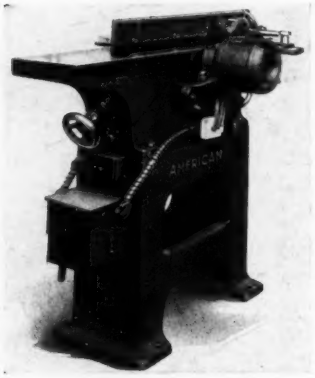
The Industrial-Arts Magazine

January 1926

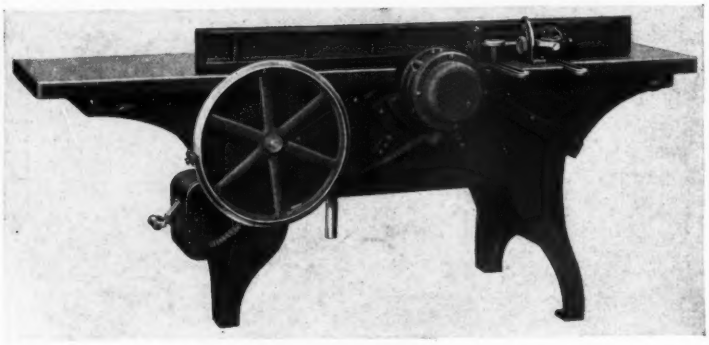
The Bruce Publishing Company
Milwaukee Wis.



American No. 1 Bench Jointer

Knowledge Gained on American Machines will never Desert You

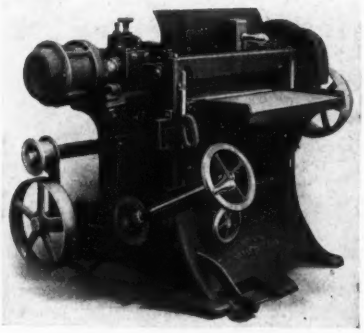
Training in Shop Practice should always be done on real shop machine.



American No. 1 Buzz Planer and Jointer

American Machines spring from the highest requirements of the industries. They are industrial machines.

"The tools of school are the tools of life"



American No. 1½ Single Surfacer

Yates-American Machine Co.

Educational Department

ROCHESTER, N. Y.

The Industrial-Arts Magazine

An Educational Monthly

VOLUME XV
1926

MILWAUKEE, WISCONSIN
THE BRUCE PUBLISHING COMPANY

The Proper Finish for Projects of Wood

THE finishing of projects of wood is most important and should receive its full share of attention. Every Instructor of woodworking realizes that a beautifully constructed model may be ruined if improperly finished, whereas the defects of poor construction are minimized if the model is well finished.

For years we have kept our fingers on the pulse of progress of Industrial Arts and Vocational Education. We have striven to meet their Wood Finishing needs. That we have been successful is demonstrated by the fact that Johnson's Artistic Wood Finishes are used in nine-tenths of the schools in the United States and Canada. The endorsement of the world's foremost Instructors of Industrial Arts and Vocational Education is a convincing tribute to the merit of our products.

Our line of Artistic Wood Finishes is complete—it includes *Johnson's Wood Dye, Paste Wood Filler, Under-Lac, Polishing Wax, Varnishes, Enamels,* and *Undercoats*. They are all easy to apply—the youngest and most inexperienced pupils can use them with splendid results.

JOHNSON'S WOOD DYE

With Johnson's Wood Dye inexpensive soft woods may be finished so they are as beautiful and artistic as hardwood. All shades may be easily lightened or darkened. Directions on every label.

17 Beautiful Shades for STAINING WOOD

Johnson's Wood Dye penetrates deeply, bringing out the high lights of the wood without raising the grain. It is simple to apply—goes on easily and quickly without a lap or a streak.

FREE—*this valuable book*

Our new "Text Book on Wood Finishing for Instructors and Students of Industrial Arts and Vocational Education" is just off the press. Wouldn't you like a copy for each boy studying woodworking? We will gladly send the required number Free and Postpaid to Instructors who are using or will use Johnson's Artistic Wood Finishes in their woodworking shop. Use coupon at right.

We have a complete set of Wood Finishing Job Sheets (eight in all) which show job specification—job application—material—tools and equipment—procedure, etc. We will gladly send these Job Sheets postpaid and free of all charge to Instructors of Wood Finishing.

S. C. JOHNSON & SON, Dept. I. A. 1, RACINE, WIS.
"The Wood Finishing Authorities"

We have ..... boys studying woodworking and would appreciate receiving the following material:

☐ *Wood Finishing Job Sheets*
☐ *Text Books on Wood Finishing*

We buy most of our Wood Finishes from .....

NAME .....

ADDRESS .....

CITY AND STATE .....

They'll learn more by **doing** *than by watching—*

Union Woodworking machines embody all the qualities and refinements of big, expensive machines, but they are compact in size and moderate in cost.

On the initial and upkeep investment required for a few large machines, you can install enough Unions to give every student actual training and experience, not just once in a while, but every time the class meets. Union Portables are compact, accurate and ideally suited to the run of school work. Let us give you all of the facts.

Gallmeyer & Livingston Co.
214 Straight Ave.
GRAND RAPIDS, MICHIGAN.

This Free Book—

This Free Book completely describes a number of woodworking machines which many schools are using to great advantage. Write for it.

UNION PORTABLE AND BENCH TYPE WOOD WORKING MACHINES

Good tools help make good workmen

Here is a high speed ball bearing lathe which proves that safety is not incompatible with high speed, accurate work, and pleasing design.

While primarily designed for use in manual training schools, it is capable of turning out work which would delight the heart of the most fastidious craftsman. We sell many to schools on the basis that respect for good tools is an important part of any course in manual training.

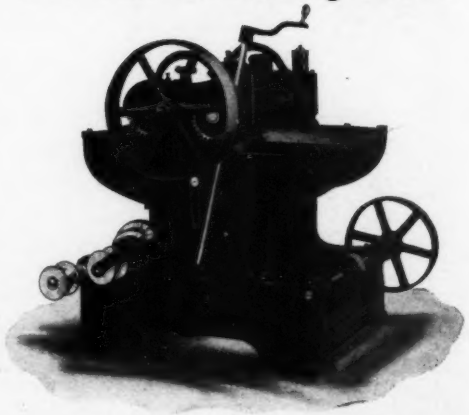
The same high standards make "American" saw benches, planers, jointers, band saws and workers preferred by instructors who want their students to have the best there is.

Write for free booklet.

AMERICAN SAW MILL MACHINERY CO.
74 Main St., Hackettstown, N. J.
1374 Hudson Terminal Building, New York City
American Manual Training Equipment.

No. 183

New Model Finishing Planer



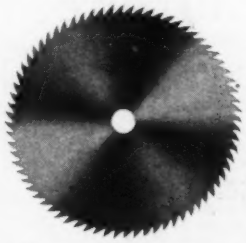
No. 183 is the very latest in finishing planers. It is built in three sizes—20, 24 and 30 inches. The table lowers 8 inches. Machine is furnished with three rates of feed. No. 183 forms part of the equipment of the largest manual training departments in St. Louis.

Write for complete description.

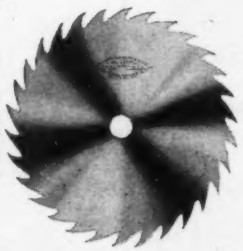
Hall & Brown Wood Working Machine Co.
Broadway, Tyler, Ninth Sts.,
ST. LOUIS, U. S. A.

The Disston Combination Saw for the school. It cross-cuts or rips equally well and makes a smooth, accurate joint.

For Smooth Cutting in the School Shop



Here is the Disston Saw for cross-cutting only. Made of Disston Steel, hardened and tempered by Disston methods to cut fast and stay sharp.



The Disston Saw for ripping. Disston grinding methods prevent binding. Disston Steel keeps the teeth sharp. Disston tensioning insures accurate cutting.

A smooth cut that makes a perfect joint without sanding or dressing—

That is the kind of work you get with the Disston Combination Saw.

Here is a saw that you need in the school shop.

You can cross-cut or rip equally well. Either with or across the grain you get that smooth, accurate cutting that makes a better job.

The Disston method of hollow grinding gives plenty of clearance in the cut. No setting or swaging of teeth is necessary. Saves time and work in upkeep.

Furniture and woodworking plants — where smooth cutting is vital—use thousands of these combination Saws.

Made of Disston Steel, hardened, tempered and tensioned by methods developed over eighty-five years of saw making.

Two types: one with five cross-cut teeth and one cleaner tooth to each section which is preferable where more of the work is cross-cutting.

And one with three cross-cut teeth and one cleaner tooth that is preferable where more ripping is done.

But — you can cross-cut or rip with either type.

Write for information.

Henry Disston & Sons, Inc.

Makers of
"The Saw Most Carpenters Use"
Philadelphia, U. S. A.

DISSTON

SAWS TOOLS FILES KNIVES STEEL

SIMONDS

Best School Tools

Better work and better mechanics result when Simonds Saws are used in Manual Training and Vocational Schools. The Simonds Hand Saw stands up to the work and holds its edge longer. Most schools require small circular saws and the majority are now specifying Simonds because they give greater service and require less fitting. Files and machine knives are also Simonds Products which help make more efficient work in schools.

Write for prices and catalog

Simonds Saw and Steel Co.

Established 1832

Fitchburg, Mass. **Chicago, Ill.**

The Silver

Portable Electric Saw

For Rip-Sawing, Mitreing and Cross Cutting
Attaches to nearest Light Socket
A Compact, Powerful and Inexpensive Saw for the Manual Training Department

No. 895
A Silver Quality Product

Send for complete description and prices

THE SILVER MFG. CO., Box 397, Salem, O.

Manufacturers of Quality Goods Since 1854.

THE JOHNSON FRICTION CLUTCH

Fifteen No. 2 Single

Johnson Clutches

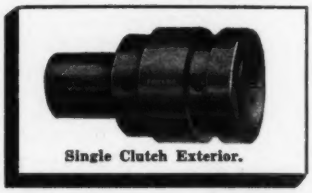
are in use every day in the

South High School.

—AKRON, OHIO.

In the Akron, Ohio, high school, fifteen Johnson No. 2 Single Friction Clutches are installed. They give highly satisfactory service driving manual training lathes from lineshafting, running at 500 R.P.M.

Similar Johnson installations in schools in EIGHTEEN states are giving equally splendid satisfaction.



Single Clutch Exterior.

The schools of greater New York can hardly get Johnsons fast enough. James Monroe high school has just added twenty-four. The James Madison high school, Brooklyn, has installed twenty-five. Stuyvesant high school has 150 Johnsons. YOUR children are as dear to you as the Greater New York children are to their parents—get these advantages for your children. Insist on Johnson Clutches.

Write for Catalog "IAM"

THE CARLYLE JOHNSON MACHINE CO. MANCHESTER, CONN.

You too, can Braze Your Band Saws with Electricity

OLIVER

A New and Simple Way

Many customers send their Saw Blades to Oliver Machinery Co. for brazing. That is a good way but there is a better one.

Braze your own. It is simple, quick and safe with the "Oliver" No. 462 Electric Band Saw Brazer.

It mends your saws quickly. No waiting. It is inexpensive. It makes an excellent and instructive demonstration for your students.

May we send you data on this machine or on our band saw filer and setter?

STATE HIGH SCHOOL
INDUSTRIAL DEPARTMENT
R. W. JACKSON, Supervisor
CHISHOLM, MINNESOTA

January 7, 1925.

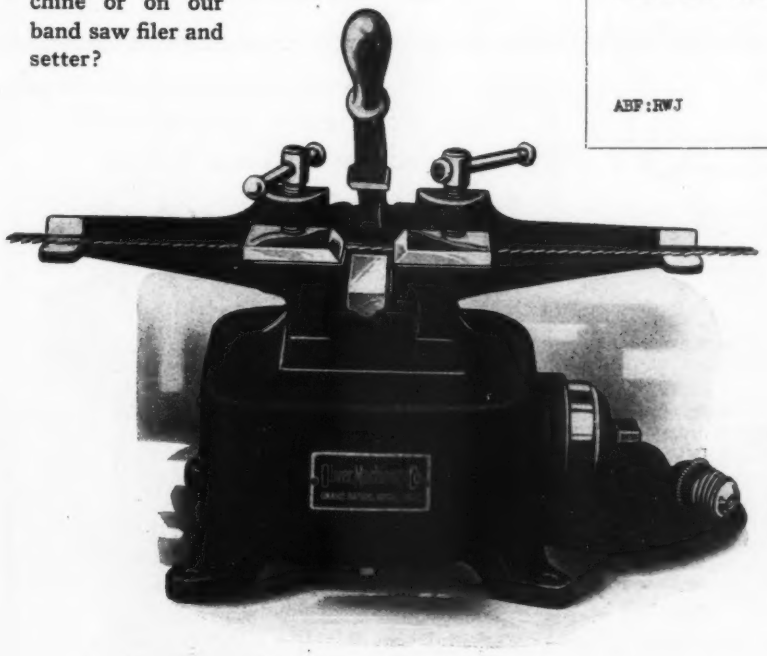
Oliver Machinery Co.,
Grand Rapids, Mich.

Gentlemen:-

I want to say just a word more in praise of the Electric Brazer No. 462-A we received from you a few days ago. I have tried this machine out and with no previous experience with an Electric Brazer find that after my second trial I can make a better Brazer and make it many times quicker than I was ever able to do with any other method that I have ever used.

Yours truly,
R. W. Jackson
Supervisor.

ABF:RWJ



"Oliver" No. 462A
(Vulcan Brazer)

Other School Users

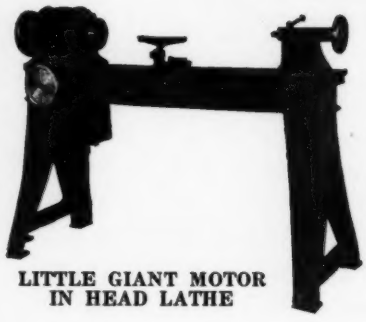
B. of E., Omaha, Nebr.
B. of E., Detroit, Mich.
B. of E., Sandusky, Ohio
B. of E., Independence, Kans.
B. of E., Philadelphia, Pa.
B. of E., Dubuque, Iowa
B. of E., Houston, Tex.
B. of E., Ames, Iowa
B. of E., Fall River, Mass.
B. of E., St. Johns, Mich.
B. of E., Pawtucket, R. I.
B. of E., Menominee, Wis.
B. of E., Bayonne, N. J.
B. of E., Superior, Wis.
B. of E., Minneapolis
Western State Normal, Kalamazoo, Mich.

Oliver Machinery Company

Grand Rapids, Mich.

Little Giant Lathes and Band Saws

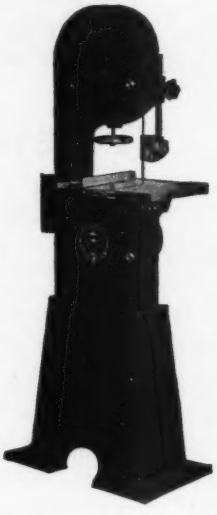
Sold on 30 Days Free Trial



LITTLE GIANT MOTOR IN HEAD LATHE

A new, handsome catalog is now ready and will be mailed free.

We employ no traveling salesman. We depend on the goods themselves to show their merits. So we sell Little Giant Lathes and Band Saws on condition that if not satisfactory they may be returned after 30 days use and we pay the freight both ways.



Write us for catalog

LITTLE GIANT COMPANY

223 Rock Street **Mankato, Minnesota**

In A Class By Itself!
The TANNEWITZ Model E-2 Combination Woodworker

In convenience and ease of operation, in size and quality of construction, in the wide range of the operations it performs and the accuracy with which it performs them — in power, safety and dependable service, the Tannewitz Combination Woodworker stands in a class by itself.

It will rip, cross-cut — mitre — bevel — groove — joint — dado — rabbet — plane — band saw — mould — mortise and bore.

Ball Bearings equipped with Gits oilers used throughout. 2 H.P. Motor—three operators can work at it simultaneously—unhampered—safely. Attachments put in motion without shifting belts. Completely guarded. A man's size thoroughly practical machine for the economical equipment of manual training schools —Let us show you— Write for bulletin E-2.

THE TANNEWITZ WORKS

303 Front Ave. GRAND RAPIDS, MICH.

The Efficiency Grinder will produce a Keen Edge

Our grinder will not burn tools.

EASY to work upon.

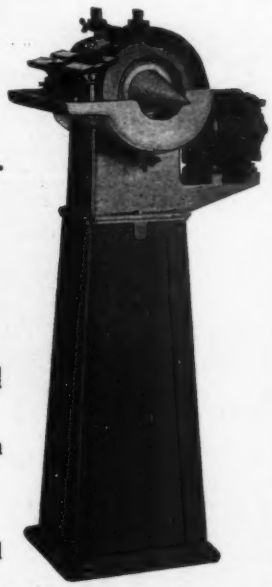
SIMPLE in construction.

EFFICIENT in results.

CHEAP in operation.

REASONABLE in price.

What more could you want?

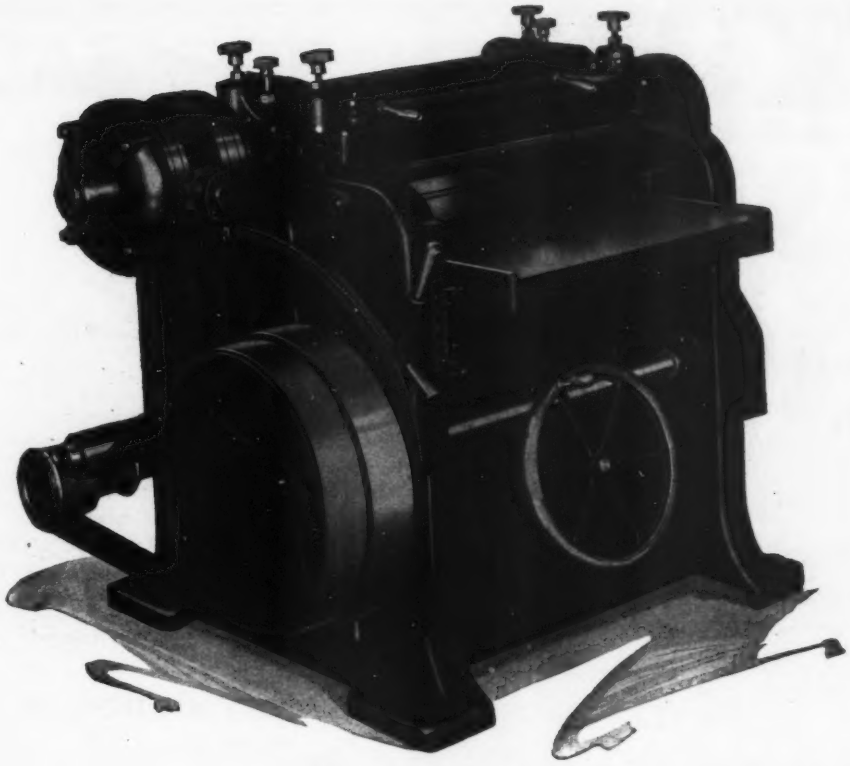


Pedestal and Bench Type. With or without cone wheel.

Send for price and information.

EFFICIENCY GRINDER COMPANY

326 W. Washington Ave., MADISON, WIS.



6 Reasons why this Planer should be in every Vocational School!

1. **Eliminates Waste and Uncertainty of Ordinary Planing.** Accurately planes stock to desired thickness and so smooth that sanding or polishing is seldom necessary. Easiest adjusted planer on the market.
2. **Accurate.** All parts machined and drilled to jigs. Carefully assembled by skilled mechanics. Rigidly inspected before shipment.
3. **Safe, Simple and Easy to Teach.** Head is 3-knife cylinder safety type. All gears and belt fully covered and guarded.
4. **Knives May Be Sharpened Without Removing From Machine.** This feature reduces operating costs and keeps machine always ready for use.
5. **Quick Make-Ready of Stock.** When additional or different stock is required, the speed and convenience with which this machine makes that stock ready is appreciated by both instructor and student.
6. **Greater Economy.** Permits buying of stock in the rough. Planes narrow strips of uneven thickness at one time. Capacity to 8" thickness.

Made in two sizes, 24" and 28" knife width, and provided with two speeds. Send for full details, illustrated bulletin and prices. Address Dept. 401.

FAMOUS

Single Surface

Planer

The Sidney Machine Tool Co.

Sidney, Ohio

SIDNEY SERVICE

ATKINS

SILVER STEEL SAWS

The Finest On Earth

The Four Hundred Saw

Here is a Hand Saw made of the finest steel the great Atkins laboratories can prescribe — genuine "Silver Steel"—ready to cut faster, stay sharp longer and outwear any other saw. It is two way taper-ground by Atkins patented process and will go through green or wet lumber with ease and precision.

The Improved Perfection Handle

The Four Hundred Saw is fitted with a Solid Rosewood Handle, piano finish; Improved Perfection Pattern — prevents wrist strain.

If you want to obtain the best saws that money and skill can produce demand the Atkins brand. Atkins Saws are made in regular width, skew and straight back, also in ship pattern, skew and straight back.

Modern Manufacturing Methods Make Atkins Saws the Leaders

Ask for our latest catalog, also "Saw Sense" and "How To Care For And Use Cross Cut and Hand Saws."

E. C. ATKINS & CO.

Established 1857 The Silver Steel Saw People

INDIANAPOLIS, U. S. A.

The No. 10 Crescent Saw Table is a sturdy, substantial machine with every convenient adjustment for general factory work and will meet every requirement for a practical saw table with self-contained motor for your manual training department.

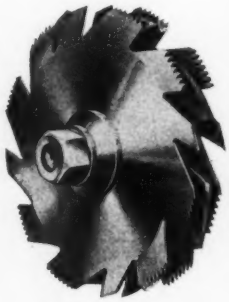
Send today for circular giving complete description. Also ask for circular of band saws, saw tables, shapers, jointers, variety wood worker, planers and matchers, disk grinders, cut off table, swing saws, borers, hollow chisel mortiser, tenoner, universal wood workers, self feed rip saw.

THE CRESCENT MACHINE CO.

25 Main St.,

LEETONIA, OHIO.

Speed up!



You can do it, even on the most complex grooving and cutting if you use the Huther Dado Head!

With this tool the most complicated cutting and grooving are made easy. Perfect work is assured, and speed throughout the whole process increased.

Made by the inventors and original patentees of the Dado Head cutter, and backed by more than fifty years experience in saw manufacture, this tool is an investment that pays profits from the very start.

Let us send you illustrated catalog showing the complete line of Huther Saws.

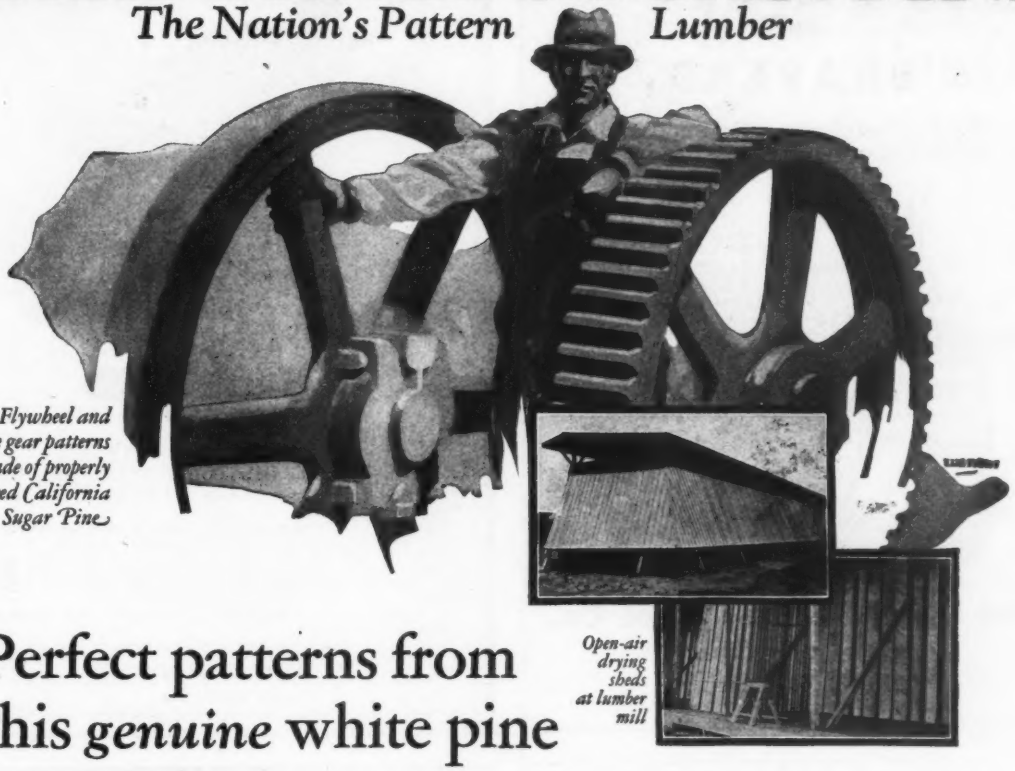
Huther Bros. Saw Mfg. Co.

Makers of Better Saws for More Than Fifty Years

Rochester, N. Y.

CALIFORNIA SUGAR PINE

The Nation's Pattern Lumber



Flywheel and large gear patterns made of properly cured California Sugar Pine

Open-air drying sheds at lumber mill

Perfect patterns from this *genuine* white pine

PATTERN MAKERS who use California Sugar Pine have no annoyance from pattern stock improperly dried.

For California Sugar Pine is thoroughly seasoned, in a climate ideal for lumber drying, and under conditions which have, from years of experience, proven best for the pattern trade.

Furthermore, California Sugar Pine may, if necessity demands, be kiln dried. In fact, the excellent characteristics of this wood is evidenced by its good seasoning qualities, without checking or warping.

There are abundant stores of California Sugar Pine pattern lumber now and for many generations to come. Large production and convenient and ample stocks assure the pattern maker a continuous supply of this *genuine* white pine.

Write for Information Sheet No. 13—full of interesting and instructive details about California Sugar Pine. Also, put any specific questions or problems up to our wood technologist.

U. S. Forest Service classes California Sugar Pine as a *true white pine*. (See Technical Note No. 215.) Its characteristics are identical with those of the old northern pine. Below, at the right is microscopic photo of the cellular structure of California Sugar Pine. At the left is one of Eastern White Pine. Scientists cannot distinguish between the two. (Photos by Forest Products Laboratories.)

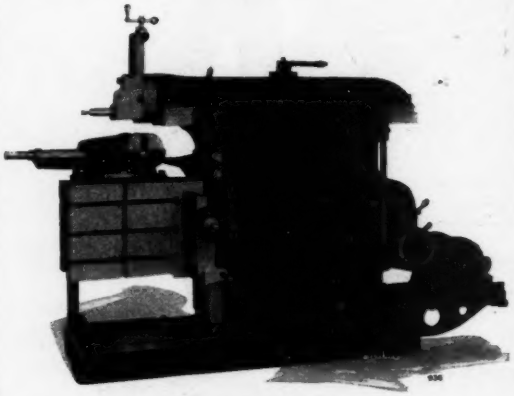
it's true White Pine

California White and Sugar Pine Manufacturers Association

663 Call Building · San Francisco

"OHIO" PLANERS
and
SHAPERS

Suitable for Tool Rooms, Production Shops and Vocational Schools.



The Ohio Machine Tool Co.

Planers and Shapers since 1887

— KENTON, OHIO —

No cutting tool is better than its edge
Keep the tools sharp

No. 475

PLURALITY OILSTONE TOOL GRINDER

THE most convenient, serviceable and efficient tool sharpening machine ever made.

This new Tool Grinder has been carefully designed to combine many new advantages with the essential features of older models. It combines five basic units in one machine: *coarse oilstone wheel, fine oilstone wheel, grinding cone, leather stropping wheel, emery wheel,* and all accessible from two adjacent sides.

It is motor driven, ball bearing throughout, and every unit is thoroughly guarded.

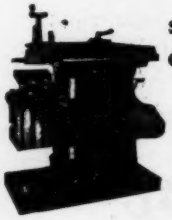
Write for full descriptive bulletin.

MUMMERT-DIXON CO.
Hanover, Pa.
Originators and Pioneer Manufacturers of Oilstone Tool Grinders

1845 — EIGHTY YEARS — 1925
Manufacturing Machine Tools

Thousands in use in shops all over the world giving daily satisfaction.

Meet the requirements of school shops because they are devoid of intricate parts and practically fool proof.



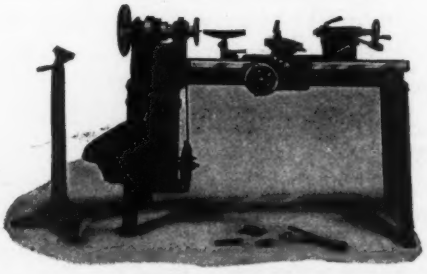
Send for catalogue describing the entire line of SHAPERS, MILLING MACHINES, LATHES and PORTABLE ELECTRIC SCREW DRIVER.

Industrial Education Dept.

THE JOHN STEPTOE CO.
CINCINNATI, OHIO

REG. U.S. PAT. OFF.
GTD

This Lathe—



218 ALL-PURPOSE LATHE

was designed to fill the special needs of school shops. Safety, simplicity, ease of operation and economical supervision requirements were kept uppermost in mind.

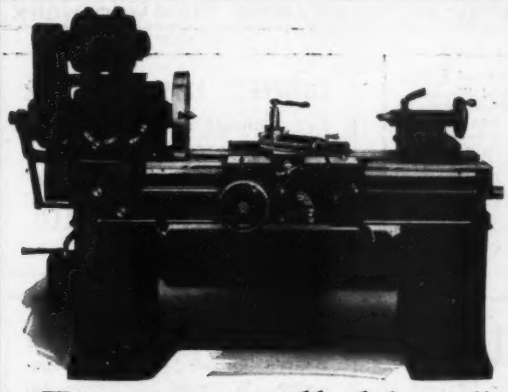
We feel confident that we have here an all-purpose lathe of which any school might well be proud.

SEND FOR BULLETIN NO. 104

GREENFIELD TAP AND DIE CORPORATION
GREENFIELD, MASSACHUSETTS

School Representatives

R. A. FIFE CORPORATION, Mamaroneck, New York



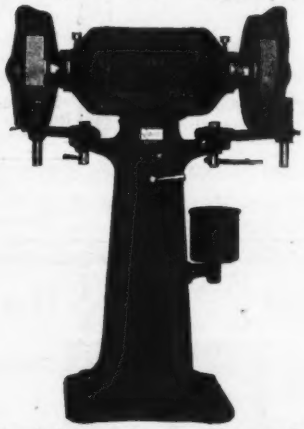
"Time tests all things"

For 40 years we have been giving a good value lathe.
We believe, in this new Gold Seal Lathe, we are giving more actual value at the price than ever before.

Gold Seal
SEBASTIAN LATHES
GUARANTEED CORRECT

The Sebastian Lathe Co.,
602 Culvert St. CINCINNATI, O., U. S. A.

ARE "CLARK" GRINDERS PART OF YOUR EQUIPMENT?



"Clark" grinders can be placed in any shop where current is available. Practically no cost for setting up.

Send for catalog No. 30 giving complete details of this grinder as well as many other electrically driven tools, especially adapted for use in educational institutions.

JAS. CLARK, JR., ELECTRIC COMPANY
Incorporated
603 BERGMAN ST., LOUISVILLE, KY., U. S. A.

The Name CLARK Insures Quality

"Buffalo" Down Draft Forges

1. *Long Life*
2. *Low Upkeep*
3. *Efficiency*

Our forges are "standard equipment" at most vocational schools because of their many real advantages.

Indestructible underground duct system eliminates overhead obstructions. Forges and blowers are substantial enough to last a lifetime. Adjustable forge hoods keep shop free of smoke.

Write for catalogs showing full line of forges and drills for school use.

Buffalo Forge Company
482 BROADWAY, BUFFALO, N. Y.

ELEMENTARY WOODWORK, CABINET MAKING, CARPENTRY, PATTERNMAKING, FARM WOODWORK.

JOHN S. BENEDICT LUMBER CO.
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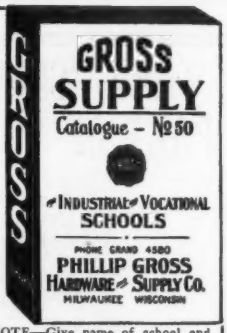

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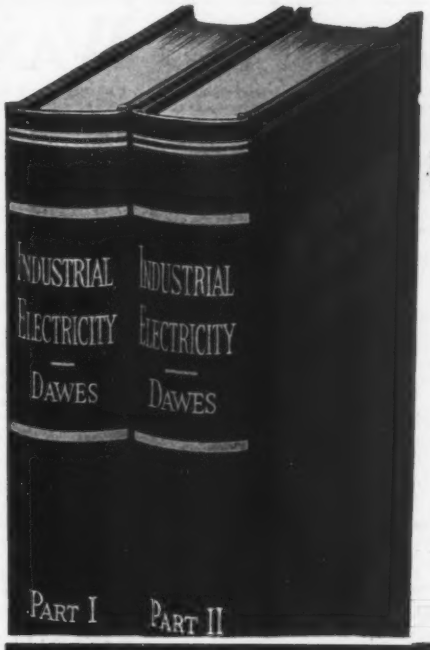

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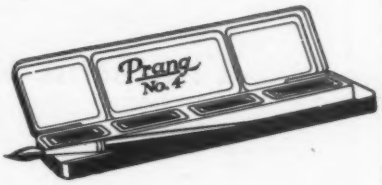

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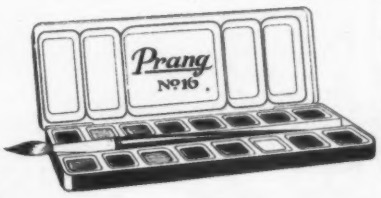

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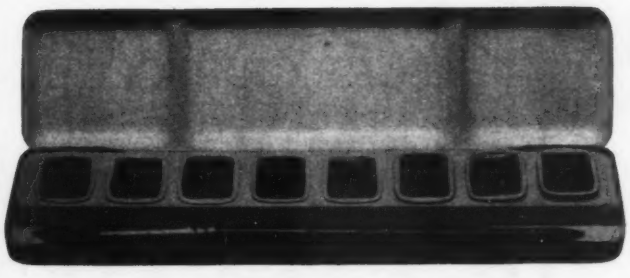

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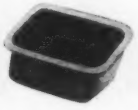

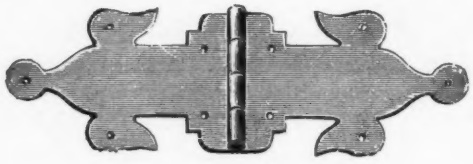
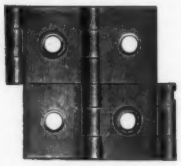

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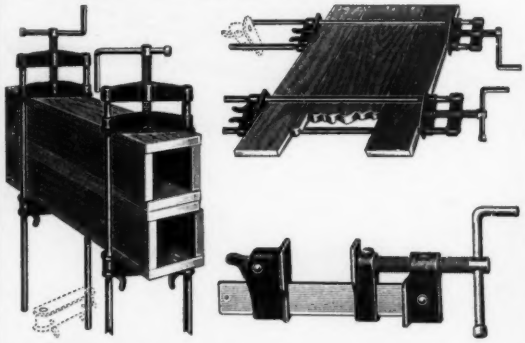

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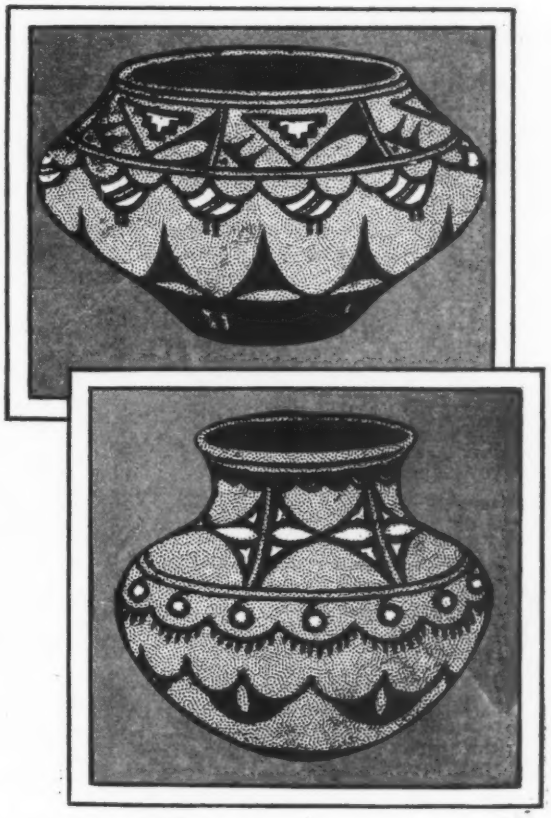

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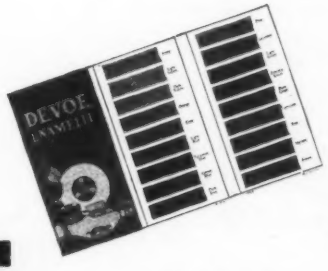

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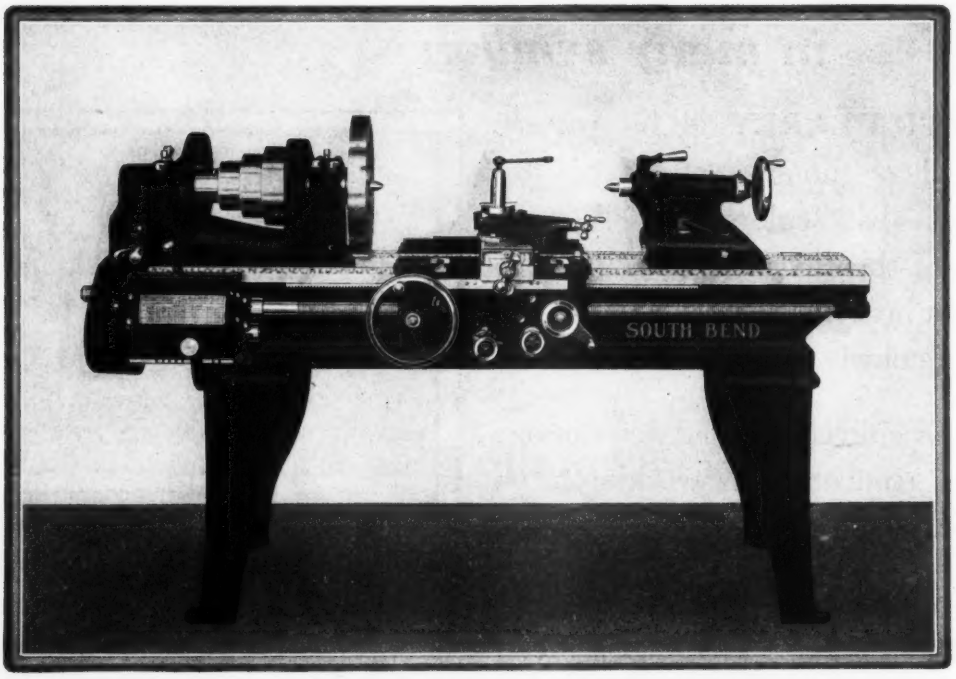

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Bulletin No. 31-A gives complete description of the South Bend Machine Shop Course.

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SOUTH BEND LATHE WORKS

273 East Madison Street **South Bend, Indiana**

Vol. XV
No. 1

INDUSTRIAL-ARTS MAGAZINE

January, 1926

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One of Many Letters

I consider the INDUSTRIAL-ARTS MAGAZINE *the best of its kind and I derive a great deal of benefit from it.*

Erling Heistad,
Lebanon, N. H.

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THE INDUSTRIAL ARTS MAGAZINE

Volume XV JANUARY, 1926 No. 1

Industrial Vocational Surveys for Educational Purposes

Lynn E. Stockwell, Los Angeles, Calif.

THE present era is an industrial one and the public schools, in order to function properly, must meet the needs of this era. In order to determine what the needs are it is absolutely essential that a survey of industrial conditions in a given locality be made. It is also necessary that a survey of what the schools are now doing be made. This is a check on how well the public schools are meeting the needs of the industrial life of a community.

The purpose of this paper is to present some fairly well defined procedure for making industrial vocational surveys. Before proceeding, it is necessary that there be a common understanding of terms. To bring about this common understanding, as far as this paper is concerned, certain terms will be defined. According to the Federal Board for Vocational Education "Vocational Education" is any form of training, whether given in school or elsewhere, the purpose of which is to fit the individual to pursue effectively a recognized profitable employment. In other words, vocational education is specific education or training for a specific vocation. It can be plainly seen that courses in dentistry, medicine, education, law, etc., are strictly vocational courses, yet we are not concerned with these courses because they are very well established and of collegiate grade. We are concerned primarily with courses which fit the large group of individuals never reaching college who must go into the industrial world to earn a livelihood. *Industrial vocational education* then is the specific training of individuals to enter a specific calling in industry. *Industry* has to do with the changing of materials to make them usable, or more usable.

In making an industrial vocational survey one must consider three elements; the boy and girl of school age in and out of school, the school, and the community. So this paper will be concerned with these three topics and discussed.

The Boy and Girl of School Age In and Out of School

Blank number one gives information necessary concerning each boy and girl in school between the grades seven to ten inclusive. Grade seven is taken as the lower limit because at this stage begins the first great increase in student mortality. This increase is due largely to retarded students reaching the age limits of the compulsory school attendance laws. Grade ten is taken as the upper limit because at this stage student mortality diminishes to a great extent, at least as far as the high school is concerned. If the student survives the tenth grade, the chances are that the high school period of four years will be completed and a college or advanced school career of some sort will be attempted.

This blank should be filled in by the student in school except points eight and nine which can be taken from the records of the school or by giving a general intelligence test and a general mechanical ability test.

Blank Number 1

Information card concerning Student in School.

1. Name..... 2. Age..... 3. Sex.....
   Yrs. Mo.
4. Address .....
5. Birthplace of Father.....
6. Occupation of Father.....Mother.....
   Sisters .....
   Brothers .....
7. Occupational choice of student.....
8. General Intelligence .....
9. Mechanical ability .....

Blank Number 2

***Information card concerning Student of School Age Out of School.**

1. Name..... 2. Age..... 3. Sex.....
   Yrs. Mo.
4. Left school: year.....Age.....Grade.....
5. Reason for leaving school.....
   .....
6. Did courses taken in school help you in your present position? .....
   How? .....

***Data taken from superintendent's records or filled in by the individual.**

The blank is to be filled out in school to eliminate any pressure or influence in occupational choice which might be brought to bear by parents or home except indirectly.

The birthplace of the father is taken to determine whether men raised and trained in a certain locality remain there to continue their life work. Point number six is taken to determine whether the student is influenced indirectly in the occupational choice by home influences. Points eight and nine are taken to be used as information in guidance work both educational and occupational.

Blank No. 2 includes the information necessary

concerning the boy and girl of school age out of school. This blank should be filled in by a member of the survey group. The information can be acquired through personal interview with the individual or taken from the records in the office of the administration. The primary purpose of this blank is to determine the causes of elimination. This method may be questionable but it seems to be the most efficient at the present time. This completes the survey of the individual of school age in and out of school. A summary of the cases, of course, is necessary in order to draw conclusions.

The School

This part of the survey is necessary to determine what the schools are now doing so that after the third part of the survey has been completed it can be determined just how well the schools are meeting the needs

Blank No. 3
What the Schools Are Doing.

1. Number of schools in which industrial courses are offered .....
2. Number of special or technical schools.....
3. List names of courses offered and enrollment in each:
   *a. ....., ...students
   b. ....., ...students
   c. ....., ...students
   d. ....., ...students
   e. ....., ...students
   f. ....., ...students
4. Total enrollment in industrial courses.....
5. Is work required or optional? Explain.....
   .....
6. Grades offered.....
7. Average time given to courses: Weeks.....
   Periods per week.....Length of periods.....
8. Aims of the work:
   a. .....
   b. .....
   etc.
9. Courses of study. (To be taken from printed reports in administration office or from instructors in charge of courses.)
10. Detail administration and supervision of industrial work.

*Example: Cabinet Making. 306 students.

of the community. The information needed for this part of the survey will be found on blank No. 3. The general purpose of this blank is to furnish as much information as possible in order that the survey group may determine the extent and efficiency of the industrial program. The blank calls for ten points. The first is the number of schools offering industrial courses. This is to find how generally industrial courses are being offered. The second point is the special or technical schools. The result of this data indicates a progressive, or lack of progressive, spirit on the part of the administration, as far as an industrial program is concerned. Points three and four are called for to determine how extensive the offerings are, and how generally pupils are availing themselves of the opportunity to take the courses. Points five, six, and seven also indicate the extensiveness of the industrial program. Points eight and nine indicate clearly whether the work is important enough to put special stress on such as formulating aims, printed courses of study, etc. Point ten further indicates the progressiveness of the school system in putting forth its industrial program.

In the survey of the schools another very important factor must be considered. It is the teacher. What of the training, the teaching load, and outside activities? It has been generally conceded that better

Blank No. 4
Teachers' Information Card
(To be filled in by each industrial teacher)

1. Name .....
2. Previous School Training:
   a. Grade ....
   (no. of years) (dates) (graduate)
   b. High school..... ....
   (no. of years) (dates) (diploma)
   c. Collegiate ....
   (no. of years) (dates) (degrees)
3. Courses taken while in service:
   a. (ex)—Ed. psych. 3 credits—Fall 1924.
   b. .....
   etc.
4. Teaching experience:
   a. Number of years.....
   b. Type of teaching.....
5. Trade Training:
   a. Name of trade.....
   b. How training was taken.....
   c. Number of years in training....as journeyman...
6. Number of periods taught each day.....
7. Extra Curricular Activities:
   a. Ex: Coaching football and basketball.
   b. etc.
8. Extra School Activities:
   a. Ex: Playing slide trombone in theatre orchestra.
   b. etc.
9. Salary per year.....

preparation means better teaching. With this in mind points two, three, four, and five on blank No. 4 are set forth to determine what the training of these teachers has been. Point six calls for the teaching load. Are the teachers teaching every period or do they have periods off for reflection and preparation? A heavy teaching load as a rule is reflected in the quality of the teaching.

It has also been generally conceded that teachers over-burdened with extra curricular and extra school duties do not give their undivided mind and energies to their teaching jobs. It is with this in mind that points seven and eight are called for.

The final point on the Teachers' Information Card is the salary of the teacher. This is taken to determine whether the system is attracting high class material by offering attractive salaries, or whether mediocre talent is coming in because of low salaries.

Another very important factor in determining the efficiency of industrial courses is the physical factor. Under this point comes rooms, equipment and supplies. These modifying factors are very important and should be considered carefully. The survey group should consider these points in a general way for the entire city, taking up such points as location of buildings and rooms, light, heat and power, ventilation, accessibility, and the care of rooms, supplies and equipment. Conditions affecting factors such as these are usually general and reflected throughout the school system so an individual check of each school would not be necessary unless some extreme condition presented itself.

The Community

The next point is the community—or, rather, a survey of the industrial and occupational life of the community. *Community* means city, town, or locality within the city or town. Blank No. 5 sets forth the

information desired from each industry and occupation represented in the community.

The purpose of this part of the survey is twofold; first, to act as a check on what the schools are offering, and, second, to determine whether workers should be trained for these certain occupations because of hazards of one sort or the other. This information is gathered by the survey group through personal visits to factories, shops and stores and through personal interviews with employer and employee.

Blank Number 5

Information Card Concerning Industry and Occupations

1. Name of industry or occupation.....
2. Number of persons employed.....
3. Number of persons of school age employed.....
4. Labor Turnover .....
5. Chances for advancement.....
6. Wages paid .....
7. Hazards .....
8. Shop conditions .....
9. Seasonal or not.....
10. Physical qualities necessary.....
11. Workers: organized or not.....
12. Workers taking correspondence courses.....
13. Mental qualities necessary.....
14. Common deficiencies of workers.....

Without this part of the survey the other two parts would not be of great value, as far as the industrial program in the schools is concerned, because there would be no check on how well this program was meeting the industrial needs of the community. At once someone will arise and say, "A great per cent of our population does not work in the community in which they were trained." This is very true to a great extent but who can convince a board that the schools of this certain locality should train their boys and girls for some foreign enterprise. There is a great possibility that training for a local industry or enterprise may tend to decrease this drifting away from the home community.

Persons responsible for establishing industrial programs in the public schools of our smaller cities usually give little thought to industrial conditions in the community and how very important this is. The courses are merely set up, influenced in some cases by finances; other cases by the teacher's knowledge of certain lines; and, again, by the superintendent.

It is very important then for industrial men and women and administrators to remember that before an industrial program is established or modified a complete survey of conditions affecting *the boy or girl of school age in and out of school; the school;* and *the community* be made.

The Cultural Value of Woodworking

Richard M. Van Gaasbeek, Head of Department of Woodworking, School of Science and Technology, Pratt Institute, Brooklyn, N. Y.

THE term cultural as used in the title not only implies the systematic improvement and refinement of the mind, but the training of all the energies and capabilities of the human being to the highest pitch and directing them to their true end.

While woodworking does not hold such a place, it nevertheless is an art. The woodworker who has learned his trade well, is familiar with the underlying fundamental principles and has the skill to apply them to a practical and useful purpose, is an artist.

There seems to be a general lack of appreciation for the art of woodworking, and perhaps the reason for failure to give the subject the recognition that it deserves and is entitled to, may be largely due to the fact that wood is altogether too common a commodity; its supply has been unlimited and our every demand has been met. Everyone wants wood, from the person who owns his or her own home and who desires to make improvements and keep the property in order, to the largest industry in the country. Our wants must be denied for a while and a fair valuation placed upon the services woodworkers are rendering in order to bring about a better understanding of what woodworking really is and what it stands for.

The mushroom mechanics that spring up over night, such as we had during the war, are not representative of the industry at large. The true woodworker knows before he starts a piece of work with his tools, just how the finished product will look. He sits down and thinks it all over, weighs, balances, reasons, makes comparisons and changes, thus eliminating many of the unnecessary alterations that otherwise would be made during the construction of a job.

A woodworking shop is as much a laboratory to the woodworker as a laboratory is to the chemist, or similar laboratories are to other industries. Blue prints are the formulas used in the shop, but instead of experimenting with chemicals in accordance with a prescription, or with electrical equipment to make a new discovery or to see what happens, the woodworker experiments in shaping, fashioning, and assembling pieces of wood to get a desired result.

Woodworking is a basic industry of the country and it is probably the oldest of all industrial arts. Its workers order their stock from the lumber yard in the rough, and in many of the larger factories and mills they fell the trees in the forest. A woodworker is called upon to design his product, make the layouts, mill, assemble, and finish—from forest to market—from the raw material to the consumer. Surely such a record must challenge recognition and establish for it an important place among the front rank industries. Woodworking is a creative industry with few if any competitors.

Let us analyze the subject and make a brief study of what woodworkers must know, and what they must be able to do in practicing their trade. It may also be necessary to make a slight comparison with a few other fields of work, not for the purpose of minimizing the requirements of such industries, but to aid in setting forth in clear relief some of the demands made upon those who have chosen woodworking for their life work. There is no intention to discuss methods of teaching, how or what should be taught. Ample material in textbooks and professional works is available.

As a general proposition, it is the writer's opinion that woodworking should be taught vocationally regardless of the type of school in which the subject is offered. Trade conventions and principles are the same the world over and there can be no real reason why the subject should be taught one way in a certain school, and differ-

ently in some other type of school, although the aim of each school may be entirely opposite.

As an illustration, reverse the order or customary trade conventions. Put the bottom or widest rail of a door on top and the top or narrow rail on the bottom. Run the rails across the door and cut the stiles in between the rails. Run the muntin from the top to bottom rail and cut the lock rail in between the muntin and stiles. Contrast the above procedure with the accustomed construction. Whether the project is a simple taboret, or complicated cabinet, it is unwise except in special situations, where circumstances alter cases and the mechanic has no control over the change, to ignore past performance. As a further illustration let us consider the teaching of home mechanics, one of the objectives of which is to teach the ordinary tasks or jobs which should be the common knowledge of all householders. An instructor was teaching a student how to refit a door by telling him to take the lock off, dress the face edge of the door, rebore the holes and reset the lock, and then refinish the edge of the door to match the other woodwork in the room. Common practice and the simplest way of doing the job would have been to remove the hinges, dress the back edge of the door and reset the hinges. The student was not being trained to enter the carpentry trade, but how much better it would have been in the interests of all concerned to have followed trade practices.

General contractors and builders are largely developed in the carpentry trade. This may be accounted for because of the vast amount of general information a carpenter who has learned his trade well must know. All carpenters must know something about mason and concrete work and make the forms for the concrete. The latter involves knowledge similar to that of a patternmaker, because the work forms the mold and not the finished product. Carpenters' work must be put up to minimize the dangers from fire hazards and framed around chimneys, fireplaces, etc., to conform to the fire and building laws. Carpenters must keep in mind the plumber, the electrician, and other mechanics, and put their frame work up properly so that it will not be necessary for other tradesmen to tear it down or excessively cut away parts for piping, wiring, etc., and thus weaken the structure. Carpenters' work is greatly varied and must conform to the requirements of the local fire laws, building code, and the best standard practices. The science, trade, or technical information which carpenters must have are products of investigation, study and research, a practical understanding of which is very vital to their success in practicing their trade.

Perfect joints do not make a building watertight or fireproof, or help it to withstand the elements and the usual strains likely to come upon the structure. Leaky roofs, bulging walls, squeaking stairs, sagging floors, cracked plaster, draughty or rattling windows and doors are unpleasant facts which carpenters who understand their trade help to reduce to the vanishing point. As an illustration let us list a few of the things that a mechanic must know in shingling a roof:

1—Always start from the bottom and lay from the eaves or cornice up.
2—Lay first course two-ply.
3—Measure back the amount of the exposure from the lower or butt end of the shingles.
4—Each shingle should lap over the two courses below it. There should always be the three layers at every point on the roof.
5—The spacing of the courses should be less than one-third the length of the shingle.
6—Shingles over 9″ should be split before laying.
7—Allow 1¼″ to 2″ projection over the crown moulding.
8—Allow 1″ projection at the gables.
9—If shingles are not stained or thoroughly wet, space one-eighth inch.
10—The heads of the nails should not be driven into the shingles.
11—Nail about 2″ above the upper line of the exposure. The covering of all nails is essential for a serviceable roof.
12—Break joints not closer than 1¼″ side lap.
13—The joints should not come over each other on any three consecutive courses.

As a further illustration consider the things that must be known in building a partition properly:

1—Studding should be in one length for each floor, cut to fit without splicing or blocking.
2—Careful cutting, fitting, nailing, bracing, and fire-stopping are all essential to sound, substantial partitions.
3—Spaced 16″ on centers to accommodate four-foot lath.
4—Any difference required in spacing should be made at one end of the room.
5—Securely nailed to sole and cap.
6—Set straight and plumb.
7—Form interior angles affording a surface on each partition where the lath ends may be nailed.
8—Bridged diagonally or horizontally.
9—Party and division walls between dwellings should conform to the local building laws in reference to filling in, fire-stopping, etc.
10—The studs should be doubled at all openings for the purpose of gaining strength and to afford a nailing place for the trim.

The analysis of the two processes just mentioned clearly show that there is a great deal for the carpenter to know besides using a hammer and a saw.

The woodworker's trade may be subdivided into concrete form workers, roughing in, outside finish, floor layers, roof framers, inside finish, stair builders, mill workers, etc., each of which special trade requires similar study and analysis if the men are to successfully practice their specialty.

Still another branch of woodworking that may be mentioned is that of furniture making and mill work, or work that comes under the head of shop work. Culture very largely rests in the knowledge of past achievements, and woodworking has reached its highest developments in the work of Chippendale, the Brothers Adam, Hepplewhite, Sheraton, and others who were the master craftsmen in the furniture world. Here is an opportunity to bring out the finest aesthetic sentiments in the human soul—to develop the creative instinct, to see things and to interpret them, to develop a love for and appreciation for the beautiful and a refinement of taste. Close observation, accurate perception, good judgment, and careful planning are required to give a wonderful opportunity for self-expression.

Tools are among the finest material developments which the human intellect has contributed to human welfare. It is doubtful if there is any other craft that is called upon to use as many separate and distinct tools as that of a woodworker, each having its own special function to perform. It requires as much skill to keep the woodworkers' tools in order as it does to use them. The secret of good workmanship starts with the ability of the mechanic to form a keen cutting edge on the special tool he uses, and it requires manipulative skill to properly use the tool and to hold the edge as long as possible. It requires judgment to select the appropriate tool for a particular operation. It requires a knowledge of the peculiarities of the wood used to get the best results and a smooth and finished cut, and it requires a knowledge of trade principles in order to know what to do.

Then again, in addition to using hand tools, shop mechanics use power machines and equipment. Here again judgment and skill are required in setting the machines to perform the required operations. To this skill might be added the need for a knowledge of the laws of balancing and power transmission. With but few exceptions woodworking machines are not fool-proof and automatic. A jointer may be set up to joint a piece of stock absolutely true; and without changing the machine in any way, the same stock can be run over again and be jointed as crooked as a ram's horn. A saw fence may be set to rip a piece of stock to a parallel width; and without changing any adjustments, a similar piece of stock can be ripped wedge shape or with a jagged edge. A successful machine hand must know the functions of each separate machine. He must know how many operations can be done on a given machine and get the job along as far as possible before moving it to the next machine; and in the event that the particular machine he needs is in use, he should know how to adjust himself to do the same operation on some other type of machine.

Then again, there is the element of danger. A machine operator must have nerve which comes only with experience. He must know how to handle himself and to avoid flying pieces; while it is probably impossible to eliminate all accidents, they can be reduced to a minimum, if due precautions are taken and the operator is familiar with the machine he is using.

The placing of the machines in the shop is another study. The routing of material, arranging the machines so far as possible so that the various operations can be done in sequence and the raw material when it once starts on its way, kept moving toward the shipping room without crossing its own paths any more than may be necessary.

A dust exhaust system is still another part of the equipment used by woodworkers. Sanitary conditions require that flying dust and shavings be reduced to a minimum. Danger hazards require that floors be kept free and clear of shavings and rippings which would in any way cause an operator to slip or trip, resulting in falling over a machine in motion. In many cases the various hoods used for catching shavings act as a safety device in protecting the workman from the cutters.

Still another branch of woodworking that deserves attention is that of pattern-making for the metal trades. Pattern-making is an art requiring mechanical skill combined with rare technical knowledge. A pattern-maker must become to some extent an engineer. He is trained to the greatest refinement in the art of woodworking. He should possess the qualifications of a moulder, of a machinist and also of a draftsman. He should understand conditions which govern the construction of patterns for the moulding of metals, especially the precautions taken to guard against warping, distortion and breaking, and moisture. Because his work is so varied, seldom making two patterns identically alike, he should be prepared to apply the fundamental principles of pattern-making as may be required in the solution of new problems as they arise. He must also comprehend all of the details of the mechanical drawing which he handles, to the minutest degree.

Unlike the other various branches of woodworking previously discussed, pattern-making does not follow any particular trade convention. The major consideration given by a pattern-maker to his work is strength, and in many cases he reverses the methods of construction used by other woodworkers. It is slow, tedious work, requiring patience and perseverance. The pattern-maker must think things through before he begins his work and he must get his job thoroughly pictured in his mind before proceeding. As an illustration, a few items he must consider may be listed as follows:

1—Upon receiving a drawing for a pattern to be made, note the metal to be used for the casting. This determines the amount of shrinkage the pattern-maker will allow.
2—What part of the casting is to be machined. This determines the additional thickness besides shrinkage which must be given the pattern in places where the casting is to be planed, turned, chipped, or filed.
3—How many castings are wanted from the pattern? This determines the kind of material and the amount of labor to be spent in making the pattern.
4—How can the pattern be made so that the moulder can make the castings most easily, and at the same time obtain a good casting?
5—How should the pattern be constructed so that it will be the best, cheapest, and quickest way for the class of pattern desired?
6—Check all of the intermediate or minor dimensions to see whether they agree with the over-all dimensions.
7—Study of economy. If different grades of material are provided, they should be used with discretion.
8—Study economy of time. Both material and time cost money.
9—See through a job and be sure to have all necessary information before beginning a pattern.

To the pattern-maker belongs the honor of shouldering most of the responsibility for the satisfactory completion of the finished job. The moulder's duty is to know how to use the pattern. To do this he requires certain technical information, such as tempering, ramming, and venting of the sand, together with a knowledge of the mixing of metals to conform to the specifications as to the texture of metal required in a given casting. The point to be brought out is that, in so far as the shape and dimensions of the product of the foundry is concerned, the foundryman cannot make a mistake. If any mistake is discovered, the blame rests upon the pattern-maker.

The machinist's duty is to machine parts of the castings. Here again the machinist is protected from making a mistake, in so far as the shape and dimensions of the product are concerned, except to machine it under size. If any mistake is discovered, the blame rests upon the pattern-maker. The point is that the pattern-maker has had to think not only about his own particular job of working in wood, but he has had to carefully study into the needs of the foundryman so that his pattern is usable and can be drawn from the sand, that the casting will check up with the drawing and meet all requirements, and that his pattern will stand up under the strain of rough usage, excessive rapping, and undue delay in removing the pattern from the damp sand in the foundry. He has had to study into the needs of the machinist and make certain allowances on various parts of the pattern before the job leaves the pattern shop. It is doubtful if a machinist working to a 1/1000th of an inch is any more wonderful than a woodworker working to a 1/32nd of an inch when you consider that in the first instance the work is automatic and mostly gauged, and in the second instance the work is done by the individual efforts of the operator. As an illustration, take the turning of a 2″ shaft, 3′ 0″ long down to within a 1/1000th part of an inch on an automatic lathe in the machine shop, and compare the same job in wood on a wood turning lathe, turning the shaft by hand to within 1/32″ and a parallel diameter from end to end. Or, take the turning of a pulley or other irregular surface on an automatic machine. Compare it with the same work in

wood on a wood-turning lathe, where everything depends upon the skill of the operator, his artistic eye, his sense of proportioning and harmony, his keen and quick judgment, his ability to select the proper tool to use at the opportune time, and to manipulate the various tools to get the shape desired—certainly a master of his machine.

While much more may be said about other branches of woodworking, enough evidence has been presented from which certain very definite conclusions may be drawn. The testimony here given points unmistakably to the cultural and educational advantages offered in the study of woodworking, which seem to be unlimited. We are by nature constructive, and in gratifying our tendencies to grow intellectual by the work of our hands, we are but in accord with the laws of natural development. Whatever may be the aim of a school in offering a course in woodworking, it is giving such students a chance for self-expression and individuality which is worth while.

Finally, if a true picture has been painted of the requirements and demands in the field of woodworking, then many of the cultural values must be self-evident. Some of these may be listed as follows:

1—Exercises the observation and teaches to interpret.
2—Provides an opportunity for self-expression.
3—Trains the reasoning powers.
4—Strengthens the will.
5—Teaches patience and perseverance.
6—Education by adjustment.
7—Adds to the student's educational and social development through acquaintance with industrial activities.
8—Discovers and develops natural aptitudes and abilities.
9—Provides opportunity for the development of the creative instinct, originality and initiative in selection, design and execution.
10—Education through discipline.
11—Develops orderliness.
12—Develops habits of accuracy, thoroughness, and neatness.
13—Develops appreciation of good workmanship.
14—Encourages a just pride in personal achievement.
15—Teaches organization, supervision, subordination, and cooperation.

Can a Shop be too Efficient?

Frederick Ames Coates, Assistant Agent, Division of Vocational Education, Massachusetts Department of Education

AN appraisal of the success of a shop teacher—either by himself or by someone else—is no easy matter. It is probably true that many such teachers follow a routine which spells failure, or some degree of success far less than their capabilities warrant, because neither they nor their supervisors possess any adequate criterion of their work. The converse is also true: a man may be considered a quite ordinary teacher, merely because the points of his excellence have not been properly weighed and valued.

Generally speaking, a teacher's ability may be finally gauged by the success of his graduates. In academic work, the final examinations of the year, or the showing of the pupils in the next higher grade to which they have been promoted, set up a standard by which the teacher can be measured more or less accurately. For the teacher of shop work, however, even this test is likely to be unsatisfactory. Examinations play a much smaller part in this type of work; and it is no uncommon thing for a given pupil or class to have its entire manual training, prevocational or vocational experience under the same teacher, thus permitting of no check in subsequent school experience. The strictly vocational teacher of a trade is expected to be able to point to a reasonable number of his graduates proving competent at journeyman work in the occupation trained for—eventually. But a test, deferred like this for years, is of little value in a case where a new teacher is being tried out prior to being put upon tenure.

The difficulty in telling whether a shop teacher is doing good work or bad arises in part from the complexity of his job. Unlike his brother of the classroom, he is not merely a teacher; he is a foreman and a manager as well. In vocational schools, he is responsible for production on bona fide commercial orders. He must maintain standards, and establish a reasonable relation between his pupils' work and the elements of cost and time. Obviously, a man may be a very good superintendent or foreman, and a poor instructor, or vice versa. In thus riding two horses at once, he is an exceptionally well-balanced individual who does not lean more heavily upon one than upon the other.

There are few things which look worse to an outsider than to walk into a school shop and find some of the pupils loafing or "fooling." One's impression of the teacher is likely to take a deep drop at such a discovery. Even though the instructor is busily engaged in doing a good job of teaching with an individual or a small group of pupils in some corner of the room the verdict of the visitor will be against him. And rightly so, too. Some time ago in visiting a school, I looked at the shop windows from outside the building, and saw a boy curled up on one of the window sills, apparently asleep. It was a long time before I could discern any merit whatever in that boy's teacher.

The opposite condition is the one in which every member of the class is busy and intent on his work. The wheels are turning, the machines are humming or making whatever noise is peculiar to them. Everything is running along like clockwork. Quite likely the instructor is able to take time to talk with the visitor, to enter into explanations of his course and methods, to act the part of the courteous host. In so doing, he makes a pleasant impression, and the opinion spreads abroad that there, at least, is a thoroughly efficient teacher.

As a matter of fact, this situation contains prima facie evidence that the shop instructor is efficiently fulfilling one phase of his work: that of foreman. He is effectively routing and assigning his work, is keeping his "employees" busy, and is probably making a good record for production. If that were the sum of his duties, he could congratulate himself on his success.

Quite possibly he is doing a good job of teaching, too; but the evidence at hand does not show it. Very probably he *thinks* that he is a successful teacher.

This is precisely the time when the wise shop instructor will begin to question himself on his work and his methods—the time when everything is running smoothly. He will ask himself why his pupils seem so self-sufficient, and he himself so unnecessary save as a monitor and foreman. A good physician may by his precepts and advice educate all his patients into such a state of well-being that the demand for his ministrations dwindles. A good teacher, however, can never undermine the need for his own services.

Everybody busy! Work being turned out as in a modern, efficient factory. This boy bending to his task on a lathe, that one on a miller. Or this boy feeding register work into a press, those others clicking the type into their sticks, while still others of their fellows are locking forms, pulling proofs, cutting stock, and performing divers other operations. Everybody busy but the instructor. What is the answer to the riddle?

There are just five legitimate reasons why a pupil in a shop might be using a machine or performing a hand operation in the turning out of a product. The instructor should be continually on the alert to see that every pupil who is busy is in a position to have his industry justified by one of these five reasons.

1. No lesson is complete until the pupil has applied what he has learned. In mathematics, the exposition or the study of a principle is followed by "examples" in which the student applies the principle. In shop work, the application step consists in the pupil's doing the job or performing the operation which he has been taught. The mere intellectual understanding of it is of no avail if this step be omitted. Everyone can comprehend, after once seeing it, just how a juggler keeps six colored balls in the air. Doing the thing, however, is quite a different matter from understanding it. In this particular instance, the doing—or the attempt at doing—is likely to develop many difficulties which are not apparent in watching the easy performance of the skilled man.

If a pupil is busy, then, because he is engaged upon the application step of a lesson, it is to be noted that two things are presupposed. First, he has recently been receiving the attention of the instructor, who has presented the lesson, demonstrated the operation, to him. Second, he is in need of the instructor's attention throughout the application step; attention which, while it may be intermittent, cannot be dispensed with. An application of a lesson is worse than useless in which, for want of supervision, a learner is allowed to fall into error and acquire a wrong habit or a wrong conception of doing the work. Some operations—as the composition of type in printing—are so slow by nature that the instructor can give intermittent attention, and still have considerable leisure, so far as any individual pupil is concerned.

So in our supposed shop full of busy boys, it may be that the instructor legitimately has a "breathing spell" in supervising the application of a lesson already taught. If several minutes elapse, however, without any apparent demand on the instructor's attention, it is time to wonder why. Or, if every time a visitor comes into the shop the instructor seems to have plenty of time to talk to him, the coincidence might well give rise to a suspicion that he is slighting his duty as a teacher.

2. A given pupil, or an entire group of pupils, may be undergoing a test. The teacher assumes and believes that the boy is able to do the particular job that he is doing; but he wants to make sure of it before passing on to another. This is a perfectly legitimate reason for a pupil's self-motivated employment. Testing a pupil's acquirement or accomplishment may, too, demand less of the instructor's constant attention than does the application step. A test may be of a single operation, or incidentally of all the operations entering into a job or project. A thesis in a college course is a test of a broad kind, which includes within it incidental tests not only of many specific parts of the course, but of preceding courses, of the student's entire educational and mental outlook. In a certain textile school, each candidate for graduation must submit as a "thesis" a bolt of fabric which has been manufactured, in all its operations, by himself. In meeting this test, he must do the carding, the spinning, the designing, the weaving, and so on. The time which he spends on any one operation, as for example the weaving, is not wasted even though the weaving process is already familiar to him. Testing is a legitimate and a necessary part of any course. Needless to say, it can be overworked: can be given too frequently and extended too long.

3. Practice is a third proper reason for keeping a pupil on an operation which he already knows. Ordinarily, practice would follow a test of the pupil's ability to do the job at all, and precede a test of his ability to do it at a determined standard speed or to a determined degree of accuracy. Speed and accuracy come in most operations only with practice. Trade judgment is also developed through practice. Whether any school should attempt to bring its pupils up to the commercial, competitive standard in these qualities is a question which has been mooted. At any rate, every instructor should know definitely just what standard he does intend to have his pupils meet. Practice prolonged beyond the point where the pupil does meet the standard, is a waste of the pupil's time. If a boy in a printing shop can accurately feed a job press fifteen hundred sheets an hour, he should not be allowed to spend any more time on a job press. There is, of course, a strong temptation to let him do it, since that would increase the production and also relieve the instructor of one of his many supervisory worries. That way, however, lies exploitation of the pupils' labor. Under no circumstances is it warranted. Practice work may occasion-

ally be justified after the passing of a satisfactory test, as a precaution against allowing the pupil to forget or lose the skill which he has acquired.

4. Familiar work may be performed by a pupil incidentally while he is learning something new. A high school senior writing a composition is getting practice in penmanship and spelling which—in rare cases!—he may not need, being already up to standard in those subjects. A machine-shop boy doing an intricate piece of turning is utilizing abilities in starting and stopping the lathe, controlling the feed, and using the micrometer, which once formed lessons in his course, but in which as such he has no need of further practice. A wood-shop boy may be given a project to work out, which involves a great deal of what he has previously learned. Though for him the "lesson" may be almost entirely on trade judgment and technique, it is neither feasible nor desirable to call a beginner to his aid every time there is need of a simple operation such as sawing off a board. He will do it as an incident of his larger purpose.

5. A pupil may be allowed to work with hand tools, or occasionally at a machine, in an experimental way. Sometimes it is good to let a boy set up a goal and work towards it with himself as his own teacher. Experiment, however, is very susceptible of being overdone. In some shops the pupils do a great deal of experimenting without the knowledge or the intent of the teacher; merely because he is too inefficient to see to it that each pupil gets adequate instruction whenever he needs it. If a boy does any experimenting in a shop, it should be because the instructor definitely intends him to, and is on hand to check up and see that some value comes out of it.

When everything is going along smoothly and merrily, then, the good shop instructor will stop, look, and ask himself questions. "Is George grinding those valves merely because I know he is proficient at it, and will do a good job in good time? Is Charlie cutting that gasket because he is the best gasket-cutter in the class? Is William lining up those wheels because I know I can trust him to do it without my supervision? Or is each boy working at his particular task because of the educational value which it has for him—because one of the five legitimate reasons applies to his case?"

When things are running smoothly, it is a safe assumption that production is being attained—whether production on a commercial scale, or the individual production of the manual training shop, where a boy is making an article to bring home. The instructor is functioning as a good foreman.

After all, that is his secondary job. He is a failure unless he is also fulfilling his primary duty as a teacher; unless his pupils' employment possesses educational value which he can at any given time justify in each individual case.

New Lives for Old: Training Disabled Veterans for the Battle of Peace

Fred L. Griffin, Boseman, Mont.

WILLIAM Oliver, who saved the lives of two soldiers behind him by reaching up and catching a hand grenade and starting it back toward the German line, brought home with him a seriously deformed right hand and a sightless eye. Can he in this condition ever earn a good living for himself and his family?

Talk with William and watch him at his work and you will be readily convinced that a skilled poultry man has been developed by a three-year poultry course in the Montana State College. He has not only learned the best methods in the production of poultry but has learned how to market, how to associate with other men, and how to lecture at farmers' meetings.

On three occasions last summer he addressed the farmers in his home town at Sage Point. He explained to them that their poorly constructed poultry houses were largely responsible for the low egg production of their flocks; that chickens were not being raised because of their beauty as red roses are, so they should be culled to eliminate the unprofitable ones; that, like people, they are more efficient when they have good food and water, served regularly, and under sanitary conditions.

Every summer Oliver returns to his own homestead where, under Government supervision, he has constructed two up-to-date poultry houses and has developed a flock of about two hundred profitable Rhode Island Reds.

Before the war Oliver was a farm laborer working by the month on a cattle ranch.

His new life, which is richer, happier, more profitable and more useful than the old, has been made possible by the rehabilitation methods being used by the Government through their Disabled Veterans' Bureau. This not only provides free schooling and practical summer project work for all disabled men but supports them and their families during their period of training.

George Moore, another veteran, was for four years prior to the war a country carpenter working for local contractors. The war left him with an injured side so that now he is unable to do the harder work required of carpenters. George entered a Mechanics Art short course and specialized in drawing. Here he learned how to design dairy barns, farm dwellings, poultry houses and other farm buildings.

Last summer when he returned home he felt doubtful about finding work in the building trades which would not overtax his strength. When I met him at the State

Fair this fall he looked very prosperous and happy, and upon my asking him if he had been fortunate in finding work for the summer he replied: "Yes! I was very fortunate. When my friends saw my drawings they thought I was an architect. Right away one of them wanted me to remodel his dairy barn according to one of my plans. I hired another man to help me, and was only about half through when another farmer asked me to plan a dairy barn for him with a capacity for twenty cows.

"Upon the completion of this plan, which I worked on evenings, he gave me the job of building and equipping the barn.

"I now have three men working for me, and I assure you it is a pleasure to be the contractor and to oversee the construction of work I myself have planned.

"Money! why I never made so much money before in my life nor have I ever enjoyed myself more."

George Rogers, whose war experience left him with weak lungs, had before the war proved up on a dry land homestead near Keuka, Montana, where there have been five consecutive years of crop failure due to drought.

Last summer when he returned home he felt doubtful. Through his farm runs a ravine which every spring conveys hundreds of gallons of melted snow towards Muddy River.

In a three-year agricultural course Rogers, although specializing in truck gardening, has learned considerable about irrigation and drainage.

During the last two summers in his placement training he has utilized this knowledge of irrigation by constructing a complete irrigation project on his own farm. He built a dam across the ravine thus forming a reservoir which holds the spring water. This water he pumps up to the main canal by a gasoline-engine driven pump, and from here it runs by gravity through the laterals to all parts of his farm.

Now while his neighbors are looking for stray clouds and praying for rain, George is enjoying the sunshine while he is directing the water from his lake down between rows of thrifty looking potatoes.

Rogers has not only increased the productive value of his own farm but has proved to the dry land farmers near Keuka that irrigation there is not only possible but exceedingly profitable. Already several other systems suggested by his success are being constructed for next year's use.

Charles Lawson, before the war, was a cowboy on his father's ranch, and had only one ambition, to become a cow puncher in South America. Charles was a daring rider and an expert rope-man. Several times he participated in the roping events at the Laramie Roundup and carried away high honors.

He now has a disabled arm received while helping to dislodge a machine gun nest in the battle of Belleau Wood. Of course, he is unable to realize his South American ambition, but still being interested in cattle he is taking a four-year course in stock judging and marketing.

BUILDING

Woodson Tyree

I would that I could build a bridge,
Like the one so firmly made,
Spanning chasms deeply cut,
Within the shadows of a glade.

I would that I could build a ship,
Ploughing waves in roughest weather,
That links the nations of the world,
In purpose altogether.

I would that I could fashion metal,
Like those who harness lightning power,
To fling around the earth man's thought—
Who measure e'en the growing flower.

I would that I could give to folk,
A light that turns the night to day—
A box that by its magic song,
Makes hearts to be less gray.

I would that I'd contrived a spade,
A hammer or a plane,
Or any little trick of life,
To remove more human strain.

I would that I could do and speak,
The things and thoughts which dispel gloom,
That add a bit to human joy,
To replace a faded bloom.

I would that I could play or sing,
Or paint or act or be,
Enough of artist in some line,
To make folk burden free.

He showed his ability as a stockman last summer while he was working for a Chicago firm buying beef cattle.

In talking with one of the company's western representatives whom I chanced to meet on the train, I found that he knew Lawson very well, having worked with him part of the summer.

I asked him if he thought Lawson would be successful in the cattle business. "Yes," was his reply, "if I am not greatly mistaken, Lawson will some day be one of the leading cattle men of this country."

"What reasons have you for arriving at such an early conclusion?" I asked him. "Because he is so industrious, well trained and persevering, and because he naturally likes to handle cattle and uses excellent judgment in buying."

"Then you evidently think his boyhood ambitions have not been shattered in vain?"

"No, indeed, he may never realize his former ambition, but if he develops in the next few years as I think he will, he stands a good chance of being asked to become manager of the company's South American office."

VOCATIONAL EDUCATION

Vocational instruction is, therefore, highly desirable, and public money can wisely be employed in providing it. But to get good results its ultimate control should rest not in the hands of "educators" but in those of employers in industry, who know what they want and will gladly contribute both time and money to get it. The best vocational instruction can only come from the cooperation of that class of men with the public authorities.—San Francisco Chronicle.

Cooling the Automobile Engine

Ray F. Kuns, Cincinnati, Ohio

(Concluded from December)

Pumps. Pumps used for water circulation on automobiles are usually of the rotating vane type. Since they are installed in the water line, they are not required to do very arduous work. The impeller is provided with blades which exert a centrifugal force on the water. As the water is thrown off at the edges or outer ends of these blades, other water is drawn into the impeller at its hub, and thus a continual flow of water through the pump is set up. Fig. 11 is a pump taken from a car and sectioned or cut away to show the position of the impeller within the pump housing. Arrows indicate the passageways and direction of flow of the water. Pumps of this general design throw considerable quantities of water and exert a decided suction on the intake and force on the outlet. If long hose connections are used on the suction line, which is always the lower one, they must have a coil of wire within them to prevent their collapse when the engine is speeded up.

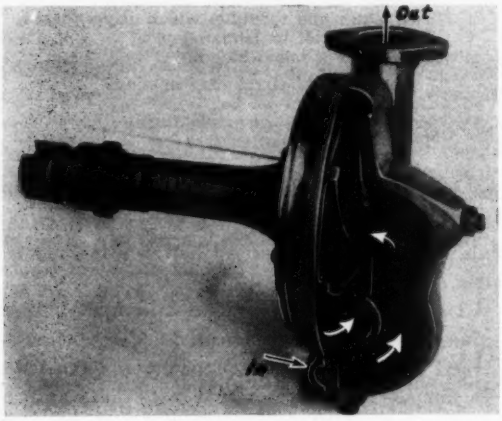


FIG. 11. SECTION OF WATER PUMP.

The pump shown in Fig. 10 is not designed to drive other accessories. The pump shown in detail in Fig. 12 and partially assembled in Fig. 13, has a shaft run through and fitted to drive an ignition unit. The gear is made to mesh with the camshaft gear and thus the shaft is turned. The gear housing and the pump housing each bolt to the engine block. Packing nuts are provided for the pump shaft where it passes through the sides of the pump housings, also where it has bearings in the pump shaft gear housing. A fan drive pulley fits on one end of the shaft and the ignition drive flange on the other. The impeller for this pump is designed a bit differently from the ones appearing in Figs. 12 and 14. The principle of operation is the same.

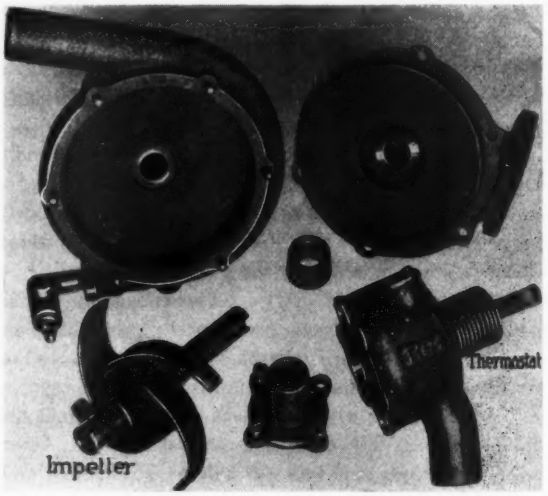


FIG. 14. WATER PUMP WITH IMPELLER AND THERMOSTAT ILLUSTRATED.

Thermostat Control. Figures 14, 15 and 16 illustrate a thermostat built into a pump. The water passages are shown. The thermostat is the spring-like device appearing in Figs. 14 and 15, the dismantled and partially assembled views. The thermostat consists not of a spring but of a gas and liquid-tight unit constructed of very thin copper or brass. This unit is supplied with a liquid which evaporates at temperatures considerably lower than that at which water will boil. When the engine has been in operation for a time and the water, which is being

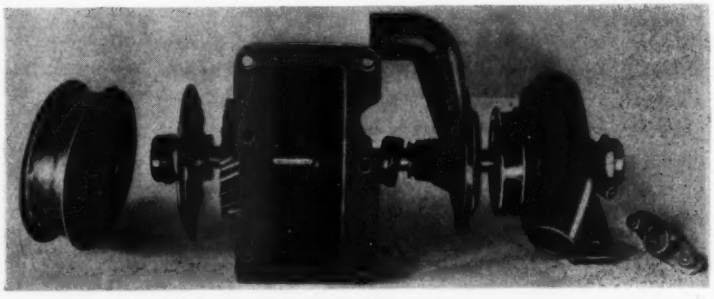


FIG. 13. WATER PUMP PARTIALLY ASSEMBLED.

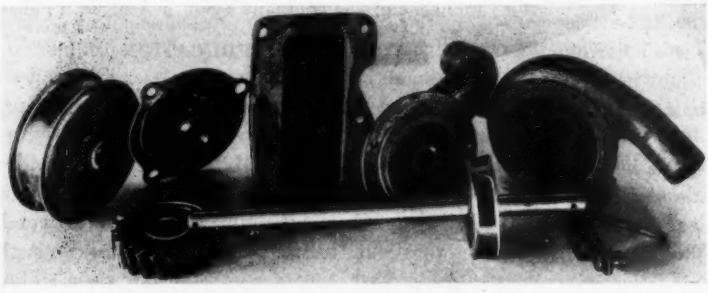


FIG. 12. WATER PUMP.

bypassed as explained above, has reached a temperature satisfactory for engine operation, the liquid in the copper unit will be boiled or evaporated. When this happens, a pressure is exerted on the interior of the thermostat, (copper unit) and a valve attached to the thermostat shaft is operated, closing off the by-pass and opening the passage to the radiator. This may occur suddenly or by degrees. The by-pass may remain closed indefinitely or for a short time only. This depends on the temperature of the at-

mosphere. Winter and summer driving offer great ranges of temperature rise and fall. The thermostat holds the engine temperature within a reasonable range, irrespective of atmospheric conditions, and without thought from the car operator. As a rule some means of controlling the point at which the thermostat will become operative, is included in the design.

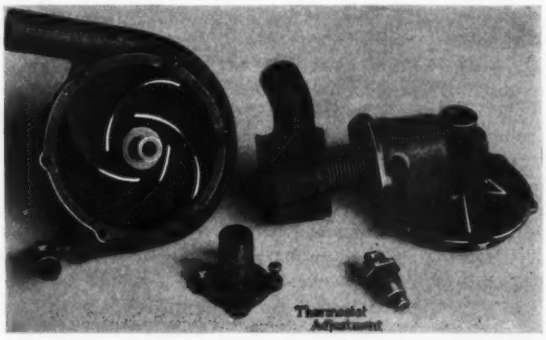


FIG. 15. IMPELLER AND THERMOSTAT PARTIALLY ASSEMBLED.

Radiator Shutters. Winter driving offers many problems to the user of the water-cooled car. Some means of controlling the air admitted to the radiator is rather essential. Papers and cardboards may be used to shut off part of the radiation, but these are likely to be troublesome. Fig 17 illustrates a radiator shell with a shutter manually controlled from the dash or instrument board. The driver can tell by the motometer or semaphore how

FIG. 16. PUMP COMPLETELY ASSEMBLED.

the temperature of the engine may be. When it rises, the shutter is opened. When the car is left standing, the closed shutter helps to hold the engine temperature up. The owner of a car equipped with this type of shutter will use it pretty well throughout the year. It cuts down the warming up period and during extreme cold weather is left closed for considerable distances.

Along with the use of the manually controlled shutters have come the thermostatically controlled shutters. These are left closed until such time as the heat of the radiator and engine influences the action of the thermostat. This then exerts the force which causes the shutter to open and holds it open. This relieves the driver of the responsibility of thinking to open the shutter and thus preventing the motor

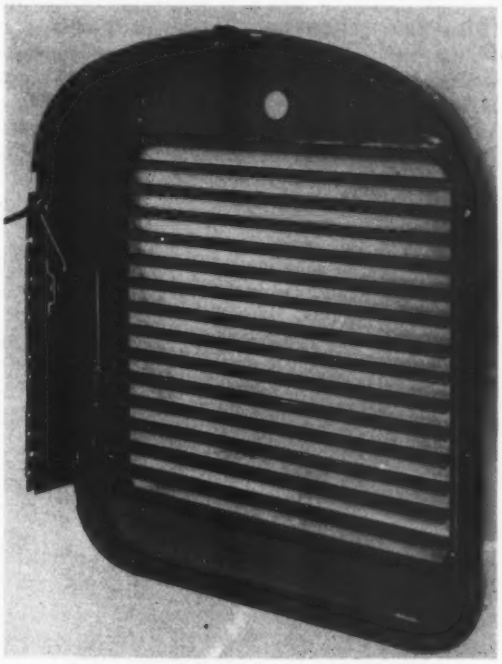


FIG. 17. MANUALLY CONTROLLED RADIATOR SHELL AND SHUTTER.

from any chance of overheating. Front and rear views of a thermostatically controlled shutter appear in Fig. 18. By loosening the fan belt, a better operating temperature can be maintained for winter driving.

Hose. Radiator or water hose which is used to connect the several parts of the cooling system, is subject to hard service. It must be clamped to rough tubes and connections in a manner which prevents leaks. It must stand the vibration and twisting strains of the power plant. It must resist the suction of the pump and withstand the effects of heat and steam. Solutions placed within the water to prevent freezing may affect it. It is only reasonable to suppose that it will need replacing from time to time. Fig. 19 shows a section of hose almost closed from the effect of long usage. Another length which caused considerable trouble, has been cut open for inspection in Fig. 20.

Anti-Freeze Solutions. Cars operated throughout the year are best provided with non-freeze solutions during

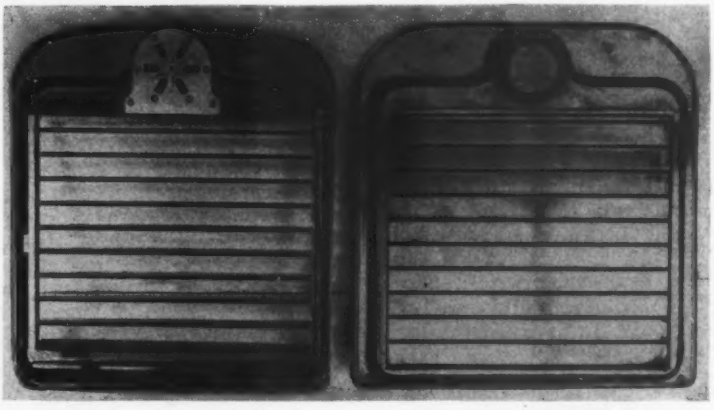


FIG. 18. AUTOMATICALLY CONTROLLED RADIATOR SHUTTER, THERMOSTATICALLY OPERATED.

the winter months, except of course where the danger of freezing is not present as in the extreme south. Alcohol has long been used and is always to be recommended, provided care is used to prevent its loss, or replacement in case of loss through evaporation. Glycerine may be the best of all anti-freeze solutions, but it is more expensive. The cost of the best anti-freeze is slight compared to the cost of parts replacement. A radiator may stand a slight frost or freeze a time or two, but a severe freeze will burst water jackets, break pumps, and burst the radiator tanks and tubes wide open. Draining is not always safe. A car may not stand level or there may be unseen pockets within the engine jacket which will freeze with disastrous results. If a radiator or cooling system is drained, the engine should be operated until the water is all driven off. A little steaming of the radiator will do no harm. Possibly the best plan is to use plenty of a

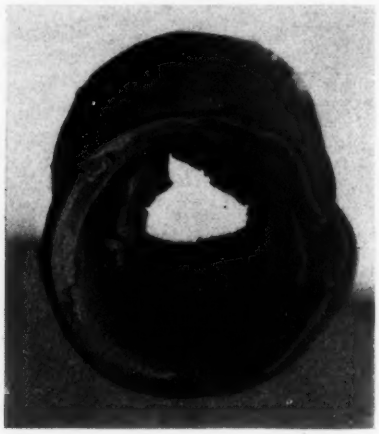


FIG. 19. CLOGGED AND ROTTED RADIATOR HOSE (LOOKING THROUGH).

safe anti-freeze and then the car is always ready for regular service. It is a bad practice to store cars for long periods. Condensation of the moisture within the air results in corrosion of bright parts and in their eventual pitting and failure. Occasional use to keep parts polished and lubricated is far better. Depreciation is far less.

Kerosene has been used with success for cooling engines in the winter time. The greatest dangers in its use are (1) failure to get all water out of the cooling system and having this water, which is heavier than the kerosene, settle to a low point and freeze, thus stopping circulation, (2) or have the engine overheat and drive off the heavy white fumes from the kerosene and thus fill the car with unpleasant and dangerous fumes. Kerosene will not take up heat from the engine as rapidly as water.

Honey and water in equal parts gives a solution which is safe but is rather difficult to handle. The honey will not evaporate with the water. When refilling use water only.

Pure calcium chloride, five pounds to each gallon of water, gives a solution which will freeze at about 40° F. below zero. The greatest dangers from its use is the eating away of metal parts, particularly aluminum. It also has a tendency to form a crust on the inside of the passageways and clog or partially clog the system.

Using Alcohol. Most motorists are rather familiar with the methods of using denatured alcohol for preventing freezing of the cooling solution. Several practical points of information are given here. Alcohol boils at a temperature lower than that of water and a solution of alcohol and water will boil at temperatures ranging downward as more alcohol is added. These temperatures are given in the tables below. The only way by which it is possible to know the strength of an alcohol solution is to use one of the several types of freeze meters or solution testers. When a reading of the solution in the radiator is made, the strength of the solution is then adjusted to suit the weather conditions. Tests show that alcohol is boiled away or evaporated at the rate of about one quart to 125 miles of average driving. This must be replenished, or the solution is not safe for low temperatures. It is rather unfortunate that the boiling point of alcohol and the alcohol solution is so low, since it is

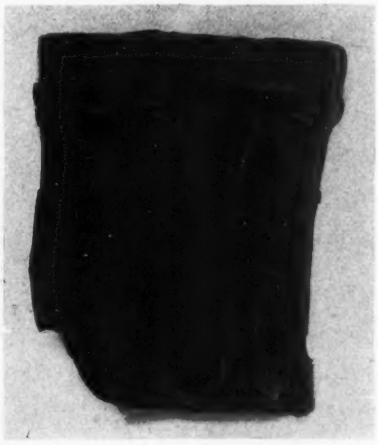


FIG. 20. SECTION OF A ROTTED RADIATOR HOSE SPLIT AND OPENED FOR INSPECTION.

otherwise an ideal mixture to handle and use. There is a comparatively slight danger from fire or explosions from the alcohol vapors. Bringing an open flame into the spaces filled by the vapors thrown off by the radiator may result in setting them on fire. Do not use a lighted match for inspection when draining alcohol from a radiator. A spark under the hood may by chance ignite the vapors if all conditions are just right. This same thing holds for the fumes or vapors thrown off by kerosene if it is used.

Using Distilled Glycerine. Crude Glycerine may contain electrolytes such as salts, acids, or alkalies, any one of which will result in corrosion of the metallic parts of the cooling system. In order to procure a product free of any harmful ingredients, distillation has been

COMPARATIVE TABLES OF DENATURED ALCOHOL AND DISTILLED GLYCERINE

Loss of Anti-Freeze Properties

Per cent by Volume	Glycerine Boiling Point °F	Per cent Glycerine in Vapors	Alcohol Boiling Point °F	Pct. Alcohol by Weight in Vapors
10	214	0	199	49
20	216	0	190	64
30	217	0	187	71
40	221	0	183	76
50	225	0	181	80

Freezing Points of Glycerine and Alcohol Solutions

Per cent Alcohol by Volume	First Crystals Appear at	Pct. Distilled Glycerine by Volume	First Crystals Appear at
10	27° above zero	10	29° above zero
20	19° above zero	20	21° above zero
30	10° above zero	30	12° above zero
40	2° below zero	40	0° at zero
50	18° below zero	50	15° below zero

Owing to the fact that crystals may form without any damage, and the further fact that the mass of solution will not become solid until considerably lower temperatures than the ones mentioned are reached, the following table is suggested as a safe one to follow. The table is suggested for use with either distilled glycerine or denatured alcohol. The expense of using either will depend on the initial costs and the amount of driving.

Where the lowest temperature to be expected is	Use a solution of the following per cent by volume
20° above zero	15
10° above zero	25
0° zero temperatures	35
10° below zero	40
20° below zero	45
30° below zero	50

resorted to and products known as distilled glycerine for use in cooling systems are on the market. These products are rather free flowing, not nearly so heavy as the crude glycerine.

Glycerine is almost as effective in the prevention of freezing as denatured alcohol. That is the same amount of distilled glycerine will prevent freezing to practically the same low degree of temperature as will a given amount of alcohol. Glycerine having a boiling point higher than water, it is not evaporated and, when the solution in the radiator becomes low, it is only necessary to replenish the water, unless the solution has leaked out. In using the distilled glycerine, it is well to mix it with some water before placing it in the cooling system; otherwise the start of circulation, especially in a thermo-siphon system may be slow.

Preparing the Cooling System for an Anti-Freeze Mixture. First drain off all the water from the radiator and then flush the system thoroughly. See that all hose connections are in good order, free from breaks and rotting, and that the hose clamps are tight. Learn the capacity of the cooling system and when filling consult the following comparative tables. It is not a bad plan to renew hose connections at this time if they have seen long service or if they appear in doubtful condition.

Teaching Projection and Visualization

R. J. Grant, Junior High School, Appleton, Wis.

At Same Old Place

Dear Pat:—

I really did not forget to write you, but knowing a teaching mind like yours craves more knowledge, and knowledge they say is power, I'm just going to step on it and give you some more "gas." There are several ways of taking that word "gas," but here is hoping my "gas" will be of 60-62 test value to you.

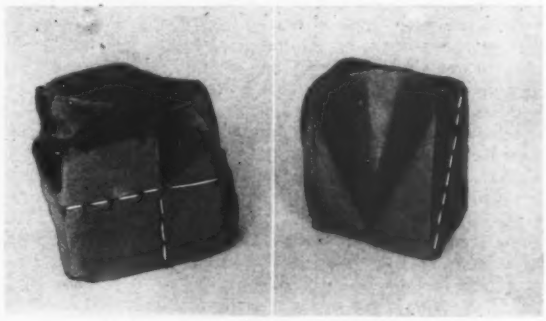
To begin with, Pat, I understand from your letter that you are teaching mechanical drawing of elementary grade. Part of that course is to teach orthographic drawing, and the biggest part of this would be the teaching of visualization. Big word that *visualization*, and sometimes a *big job* to shove it over. Your classes are all freshmen of the ordinary run who have had no previous instruction in drawing. That situation often happens in the best of families. Sometimes we are too prone to give anything in the grades except woodwork. We actually woodwork them to death without any correlation between woodwork and drawing.

The questions you ask: What is the best method of teaching visualization? How do you test the students to see if they have grasped the meaning of your mighty efforts of explanation and demonstration?

Well, Pat, you really have come into contact with some sharp problems, which ofttimes cause us tire trouble. Most of us try to remedy our trouble immediately, while others "let her go," and run in on the rim. But when you ask, "What is the best way or method of teaching visualization?" I'll have to use the words of Hans W.—"There ain't no such animal."

Let's get to our problem. You explain to your class, by use of the various frames, concrete examples, models, or any other method which you've learned, what we really mean by orthographic drawing, the location of views, their relative position when drawn, and just what the views represent. You explain to your utmost, answer all questions that arise. They *seem* to have swallowed bait, hook, and sinker—but, how many *really* understand just what you are driving at?

Maybe their conception is wrong. But how do you know, and how are you to find out if their conception is right or wrong, or if some have any conception at all?



FIGS. 2 AND 3. TYPICAL CLAY MODELS.
(See Projection Drawings on Blackboard in Fig. 1.)

You know that used to be my problem, and I often wondered if they really did understand—though they said they did—just what I was trying to put across. It made me think back to the time when I first came into contact with this same type of drawing. I'll admit I didn't get it for some time, and I went blindly about in deep puzzlement. This caused me to think that if I only had a way to set the puzzled ones on the right track immediately, I would be giving them a very fair start.

FIG. 1. BOYS CUTTING CLAY MODELS OF DRAWINGS ON THE BLACKBOARD.

Possibly you do this for a test: You send the students to their drawing tables and have them draw, freehand or otherwise, two or three views of some model in an orthographic manner. If the views are drawn O.K., and in relative position, you assume that the student has grasped the problem idea. If he shows he has failed to understand your meaning, what do you do? Can you explain the problem to the student on a plane surface if it does not assume any actual form or shape? How long do you work on such individual explanations and what are your results? By the looks of things we are abreast with your problems. How do you teach orthographic drawing and visualization? How do you test them to see if they have grasped the meaning?

Pat, I never thought when I started to answer your questions, that I would write so much. I am afraid if I were to stop now that I might be imitating *some* of the so-

called "educators." By that I mean telling what is ailing with our teaching but quite always failing to give a prescription for a cure. Robinson would call them "agitators" not "educators."

Here is a *prescription* as I would prescribe it. Of course, *prescriptions* from *various* sources differ and consequently mine may differ from that of other "doctors" in our field. However, mine generally helps, so let's go.

As soon as my explanation and demonstration of orthographic drawing has been presented, I draw on the blackboard, or hand out in blueprint form, a series of simple orthographic drawings, involving such problems as a cube, a square, a prism, a cylinder, etc.

To each student I give the following: A piece of oil cloth about a foot square, a knife with a long tapering blade, (a hacksaw blade ground to shape serves satisfactorily) and about one-half pound of modeling clay—the type that never hardens. You see, Pat, our ailment is serious and needs a cutting operation for a cure.

I now assign each a different problem, that is, to work from his drawing, to construct in the clay in body form the object which those orthographic views represent. Right here the student associates the drawing with the model, and starts the visualization which we are to develop. I have had students who failed to understand my explanation, although they said they did at the time, do the following sort of thing. They sliced off three thin slices of clay, shaped each to a corresponding view of their drawing, placed the slices in a relative position, and presented me with these slices laid out on a piece of paper like mother's cookies. It was gratifying, Pat, that I was able to get these students on the main highway without any detour. You can realize how those boys could carry a false impression for days if they were not immediately checked up. Each student does his own problem. Those who have solved a problem give no help to those who are working on a similar one. As soon as a student completes his problem, another is given him; and, Pat, you'll be surprised how many type problems they can do in a short time. Too, there are chances for competition which give an incentive to learn to visualize, and the boys also are fond of modeling the clay.

Later, after hidden lines, projections, recesses, etc., have been explained in this way, harder problems may be given to execute in clay model form.

While modeling the problem, the student may and can turn, hold the clay faces in all different ways corresponding to his orthographic views. He can at once see *why* a lines is here, *why* it is there, *why* it terminates, *why* it is invisible, etc. Once we see *why*, we know, because seeing is believing. The big thing is that we know the *why*. It is a wonderful way, in my belief, of developing many and all types of problems in a short space of time and in a very positive manner.

Just stop to realize how well it works when we get into sections. How easy it is to cut any type of section you prefer to show, and above all, how plainly it will show the purpose of sections. Some teachers have students construct a problem in wood when they are unable to visualize it. What do you think about the time element used for constructing only one type problem?

I haven't gone into minute detail; but I'm sure, Pat, you can readily understand the language of my prescription. Instead of doing problems on paper involving visualization which we want to teach, we do them in plastic form with a real visible reason for each representation.

Don't think for a moment that we neglect the drawing end. I believe that we should associate every phase of this work—I am going to sum up a few of the things worth repeating.

The clay is plastic; it can be used over and over with only one initial cost. Mistakes are *easily* and *quickly* corrected. The clay can be molded to any shape or form with little effort, skill, and time, and can be cut to show any type of section. Hidden lines are easily placed on all faces of a clay model in proper places and the *reason* for such placing is easily seen. The association of the drawing and model is quickly accomplished. The last and most important is that the student can see the reason or the *why* aspect.

I do not intend in this letter to say anything about the teaching of actual drawing methods. However, it is my belief that if one cannot visualize the language of drafting, the drawing, freehand or otherwise, is quite useless.

If you care for it, Pat, I should be glad to tell you about teaching the mechanical part of drawing with special devices constructed for that purpose.

Again, I'll say this is a lengthy letter, but if I have been able to help you in your problems, it is worth the effort. I realize, as in your case, that the initial year of teaching is the start of an education that no school or college can offer.

I suppose you'll be trading your Lizzie for the new model. Do you help with coaching? I don't indulge any more; have only one iron in the fire. Of course, you slip over to Milwaukee often since Adela K. is teaching there.

We'll I'm out of "gas" so I must stop. Let me hear from you soon. Enclosed are pictures showing students executing old man clay.

Yours,

Thomas.

Organizing and Teaching Elementary Machine Shop Practice

G. H. Snaddon, Northwestern High School, Detroit, Mich.

The "tryout" course of study here outlined is the outgrowth of five years' experience in the 8A grade with a time allotment of ten weeks, six 60-minute periods a week—a total altogether of sixty clock hours. The industrial or trade course has been adopted to the ninth grade or above, where the time spent in the study of the subject is one 40-week year, three 60-minute periods per day, or a total of fifteen hours per week.

I. Equipment

The equipment on which the courses are based consists of the following:

10 9x3 Lathes.
1 12x5 lathe with taper attachment.
1 13x4 Lathe.
1 20" Upright drill press.
1 Sensitive Drill Press.
1 Universal Grinder with standard attachments.
1 8" Bench Grinder.
1 Plain Milling Machine No. 1½.
1 Plain Milling Machine No. 0.
1 Draw Cut Power Saw No. 1.
1 Mandrel Press No. 1½.
1 Muffle Furnace (Gas).
3 Anvils, Vulcan No. 15, 150 lbs.
12 4" Vises, No. 104.
Individual lockers for students.

II. Subject Matter

The subject matter of the courses is based on:

1. A careful and comprehensive analysis of machine and hand processes to determine the essential operations involved and the trade technical content.

2. A study of the field of related auxiliary information to determine the kind and quantity of topics to include for the time allotted.

3. A study of the types of useful or usable products containing fundamental processes for completion which can be made with the above equipment and by boys of fifteen years of age or over.

4. A study of the psychological needs, interests, and abilities of pupils taking the courses.

The arrangement of the various units is not according to any pedagogical sequence. Bench work is listed first, for convenience—not with the idea it should be taught first. Some grouping is necessary in beginning classes, whereby some pupils start at bench work, a number at machine work, and others are given various other assignments. For this reason the starting point in

COURSE OF STUDY IN MACHINE SHOP PRACTICE—8A GRADE

Units of Subject Matter.	Specific Aims, Standards, and Objectives.	Teaching Material: Theory and Practice			Methods and Teaching Devices. (Suggestions to Instructors.)
		Topics for Discussion and Research.	Laboratory Work. Processes.	Laboratory Work. Projects and Problems.	
1. Bench Work. a. Laying out	1. Ability to lay out work independently from blue print or sketch to within .015 of an inch of required dimensions.	1. Methods of laying out work. 2. Care of tools and equipment. 3. Names and uses of tools used. 4. Related mathematics. 5. Machine shop work as an occupation. 6. Related vocational guidance information.	a. Squaring. b. Centering. c. Scribing.	Drifts. Combination Wrenches. Riveting Hammers. "C" Clamps. Bench Stops. Angle Brackets. Square Head Screws. Centering Stock, etc.	1. Demonstrate briefly the proper methods of using laying-out tools. 2. Illustrate various other methods which will obtain the same results. 3. Review demonstrations frequently, using question and answer method. 4. References: Leonard, "Machine Shop Tools and Methods," Ch. XXXI; Machine Tool Operation, Burghardt, Part I. Chapters I and XIII.
b. Filing	1. To be able to do any light rough filing that simply calls for the removal of metal. 2. Ability to file to a line, or so as to fit a gauge within .015" limits.	1. Files and filing. (a) Kinds and cuts of files. (b) Care of files. 2. Safety and accident prevention applied to bench work.	a. Rough and finish filing. b. Filing to line or gauge.	Drifts. Combination Wrenches. "C" Clamps. Riveting Hammers. Bench Stops. Square Head Screws. Angle Brackets, etc.	1. Demonstrate uses of files not already familiar to students. 2. Show best methods of holding work in the vise. 3. Use Disston File Chart for illustrative purposes. 4. Reference: Leonard, Ch. IV.; "History of the File." Pub. by Henry Disston & Sons.
c. Sawing (Hand)	1. To be able to saw to a line or scale measurement within .015 of an inch.	1. Hack Saws and their Use. (a) Selection of saws. (b) Speed of sawing.	a. Rough sawing. b. Sawing to a line.	Drifts. Combination Wrenches. "C" Clamps. Angle Brackets. Stock. Bench Stops, etc.	1. Show how to place saw properly in frame and demonstrate its use. 2. Use Starrett Hack Saw Charts for illustrative purposes. 3. Reference: Starrett Hack Saw Booklet: "Hack Saws and Their Use."
d. Threading (hand)	1. To be able to tap holes straight and make threaded parts fit together to required accuracy.	1. Elements of Threading. (a) Use of threads. (b) Forms of threads. (c) Terms used. (d) Tap size drills.	a. Use of taps and dies.	Bolts. Screws. Studs. Nuts. Machine Parts, etc.	1. Demonstrate use of taps and dies. 2. Reference: Leonard. Ch. XIX.
2. Drill Press	1. Develop ability to— (a) Do ordinary jobs of rough drilling where no measurements are called for in locating holes. (b) Drill a hole or a number of holes to accurately described circles. For beginning work .015" may be as close as can be expected.	1. Necessary names of parts of machine and tools used. 2. Care of tools and machine. 3. Safety precautions. 4. Related mathematics.	a. Plain and accurate drilling on flat and round work. b. Countersinking.	Drifts. Combination Wrenches. "C" Clamps. Riveting Hammers. Bench Stops. Angle Brackets. Clamp Screws. Gear Blanks. Strap Clamps. Centering Stock, etc.	1. Demonstrate use of drill press. (a) How to fit drill correctly in sleeve and spindle and use of drill chuck. (b) Methods of holding and clamping work to table. (c) Necessary adjustment for speed, to table, etc. (d) Starting the hole and "drawing the drill." (e) Use of drill drift. (f) Centering stock. 2. Reference: Leonard, Chs. VII, VIII, IX.
3. Lathe Work a. Cylindrical turning on centers	1. To be able to turn straight diameters within .005 inch of given dimension. 2. To do straight turning with a number of dimensions, including locating shoulders to limits within .015 inch.	1. Lathe essentials. (a) Importance of oiling. (b) Importance of alignment. (c) Care of machine. (d) Care of tools. 2. Calipers and their Use. 3. The Micrometer and Its Use. 4. Safety precautions in connection with lathe. 5. Knowledge of stock: M. S.; C. R. S.; T. S. 6. Related mathematics.	a. Centering. b. Facing ends. c. Rough and finish turning. d. Shouldering. e. Knurling. f. Finishing. { 1. Filing. { 2. Polishing.	Arbors or Mandrels. Bolts. Boring Bars. Plug Gauges. Bench Stops. Screws—various kinds, etc.	1. Demonstrate the following when the need is greatest: (a) Aligning centers. (b) Truing live center. (c) Method of driving work. (d) Adjustment of tail-stock. (e) Grinding and setting tool. (f) Adjusting for speed and feed. (g) Rough and finish cutting. (h) Use of calipers and micrometers. (i) Locating shoulders. (j) Filing and use of emery cloth. 2. References: Leonard, Chapters XI, XIII, XIV, XV; South Bend Lathe Book, "How to Run a Lathe."

COURSES OF STUDY IN MACHINE SHOP PRACTICE—8A GRADE

Units of Subject Matter.	Specific Aims, Standards and Objectives.	Teaching Material: Theory and Practice.			Methods and Teaching Devices (Suggestions to Instructors.)
		Topics for Discussion and Research.	Laboratory Work		
			Processes.	Projects and Problems.	
b. Taper Turning	1. Ability to turn, file, and fit a standard taper accurately to a gauge. Limit .005".	1. Elements of tapers and taper turning. 2. Related mathematics.	a. Tailstock set over. b. Use of compound. c. Use of taper gauge	Lathe Centers. Taper Pins. Taper Handles. Taper Gauges. Taper Shank Tools, etc.	1. Demonstrate at various times— (a) How to set over tail-stock. (b) How to set cutting tool. (c) Use of taper gauge. (d) Use of compound. (e) Use of bevel protractor. 2. Reference: Leonard, Chapter XVII.
c. Chuck Work	1. Ability to "true up" a piece of stock to within .015" and to center and face ends of same smooth.	1. Chucks and their Uses. (a) Definitions and Classifications. (b) Care of Chucks.	a. Truing stock. b. Centering. c. Facing. d. Drilling.	Centering Stock. Lathe Centers. Screws. Bolts. Arbors. Plug Gauges. Riveting Hammers. Bench Stops, etc.	1. Demonstrate the following items when the need arises: (a) Use of three jaw chucks. (b) Mounting and removing chucks. (c) How to "true up" stock. (d) How to center stock. (e) Facing ends of stock. (f) Use of drill. 2. Reference: Leonard, Chapter XV; "Chucks and Their Uses," published by Skinner Chuck Co.
4. Plain Milling Machine	1. Ability to— a. Do plain milling to within .005" of the required size. b. Finish work to within .005" involving the use of whole turns on the indexing mechanism of the dividing head.	1. Necessary names and uses of machine parts and tools. 2. Care of tools, machine, and equipment. 3. Safety precautions in connection with the machine. 4. Related mathematics.	a. Plain horizontal milling. b. Plain indexing.	Combination Wrenches. Riveting Hammers. Bolts, sq. and hex. Flat spots on Arbors and Gauges. Parallels. Strap Clamps, etc.	1. Demonstrate setting up and use of machine, including: (a) Methods of holding and clamping work. (b) Assembling arbor. (c) Essential adjustment for speed, feed, etc. (d) How to take cuts. (e) Use of micrometer dials. (f) Use of dividing head. (g) Use of measuring tools. 2. Reference: Treatise on Milling and Milling Machines. Published by Cincinnati Milling Machine Co.
5. Power Saw	1. Student should be able to choose and cut his own stock to length not more than $\frac{1}{16}$" oversize with a minimum of saw breakage.	1. Names of parts of machine. 2. Selection and speed of saws. 3. Care in handling saws. 4. Knowledge of stock with reference to sawing.	a. Use of power saw.	Cutting stock to length, width, or thickness, for use on the bench and machine.	1. Give brief demonstration on how to operate the saw. (a) Use of vise in clamping work. (b) Method of placing saw in frame. (c) Raising and lowering saw. (d) Essential adjustments. (e) Use of stop. 2. Reference: Starrett Book, "Hack Saws and Their Use."
6. Forge.	1. Student should be able to— a. Do light forging work. b. Case-harden his own projects.	1. Principles of furnace operation. 2. Case hardening of steel.	a. General operation of furnace.	Drifts. Combination Wrenches. "C" Clamps. Riveting Hammers. Center Punches, etc.	1. Demonstrate: (a) Operation of furnace. (b) Case-hardening of steel. 2. Reference: Elementary Forge Practice—Harcourt.
7. Tool Crib	To be able to check tools in and out quickly and keep tools and tool crib in order.	1. Nomenclature of tools. 2. Care of tools. 3. Care of tool crib. 4. Checks and checking systems.			1. A tool crib assignment chart containing students' names arranged in alphabetical order is a systematic method of making tool crib assignments and providing for equal distribution of time spent by students on crib duty.

the outline is undetermined. A pupil may begin at any point unless he has completed a tryout course or its equivalent. The instructor's judgment is the guide in the matter.

III. Aims and Standards

The aims of the "tryout" course are:

1. *General.*

a. To furnish opportunity for expression of the instincts of construction and manipulation.

b. To give pupils a chance to try themselves out. Instructors must not let the desire to make a fine showing of hand work done, nor the ambition to make the course lead up too rapidly to some trade or technical course overshadow the more important aim—that of life experience. Standards of workmanship have to be sacrificed to some extent to reach this larger aim. With this in mind the time devoted to each unit of subject matter is so divided that upon completion of the course the pupil has become somewhat familiar with the entire equipment.

c. To develop intelligence, insight, initiative, and thinking power in connection with this life experience. This means that care should be taken throughout the course to avoid exploiting pupils by emphasizing the mere doing or making of things regardless of whether or not the pupils concerned are benefitted, and against emphasizing production work needed rather than the specific needs and interests of the learners.

2. *Specific.*

The specific or immediate aims to be attained for each unit of subject matter given in the outline are reasonably high, yet not unattainable, as experience has proved.

The aims of the industrial course are:

1. *General.*

a. To give a preliminary training and experience which will help fit one for efficient service in industry. (This implies the pupil has chosen this work as a vocation, with his parents, guardians or counselor's advice and consent, and that he is willing to spend a year's time in preparation.)

b. To stimulate habits of industry, of analyzing and planning to meet and solve problems as they arise.

c. To develop powers of independent attack, of use of originality, judgment, and reasoning.

2. *Specific.*

The specific standards or objectives to be attained for each unit of subject matter and for each type job are listed in the outline in column two.

(To Be Concluded)

Wild Flower Designs

VIII: Color

Nettie S. Smith, Smith Center, Kans.

The Martynia in Color. This drawing was outlined with India ink and filled in with approximately flat washes of water-color. The Martynia blossom is beautiful in form but its colors give it even more beauty. The same thing is often true of designs. Lovely form is the foundation but lovely color is the crowning glory.

A Fascinating Subject. The study of color is one of great charm. Some artists and educators have devoted years to color theory and several systems have been evolved, each of which makes valuable contributions to the study. It is well worth while to become familiar with the Wilson theory, the Munsell system, the Taylor system and others. Yet one should not become confused by their apparent differences but should try to get a broad view of the underlying principles of this subtle thing called color. What everyone needs is a knowledge of selecting or mixing colors for harmonious combinations to be used in everyday life. Every design student and every child should be allowed the privilege of sharing in color joy, moreover, without the necessity of much scientific training, or any expensive equipment.

A Simple Method. The diagrams given in Plate 16 chart the subject in about as simple yet complete a way as is possible. They are practical, easy to use, and will stimulate the imagination and originality.

Making a Color Wheel. A color wheel of this kind can be prepared small for individual use or large for class use. The color areas may be supplied by whatever means is most convenient, colored papers, crayons, tempera paints, etc., but transparent water-colors are recommended. The mixing of the colors from the three primaries Red, Blue and Yellow is a valuable exercise and fixes the hue relations in mind better than any amount of theorizing. Pure Red that is untinged by either Yellow or Blue is necessary, also pure, transparent Yellow and Ultramarine, which is pure Blue.

A four-inch circle is good, and there should be two smaller, concentric circles within. When the twelve equal divisions have been made the wheel is ready for the primary colors.

Yellow, the lightest color, is placed at the top in the space marked Y. It should be applied at its brightest or full intensity. Then Red at full intensity is placed in the area marked R. Blue is equidistant from Red and Yellow.

The Secondary Colors. Yellow and Blue combined produce Green and when the brightest, pure Green is attained its place is halfway between Yellow and Blue in the circle. Blue and Red make Purple and determine its position; and Red and Yellow make Orange, which completes the circle of six standard colors. This is the order in which they appear in the rainbow because of their natural relationship.

Change of Hue. When a little Blue is added to Yellow a greenish-yellow is produced. If more Blue is added gradually it changes to Yellow-Green, and finally to Green. To represent these intermediate hues let us choose one about half-way between Yellow and Green and fill in the space marked Y G.

When still more Blue is added to Green we get various hues of Blue-Green and Green-Blue. From these we choose one to designate as G B.

In this way we continue around the circle to Blue-Purple, Purple-Red, Red-Orange, and Orange-Yellow, the remaining intermediate colors.

Warm and Cool Colors. Orange is the warmest color and Blue is the coolest, with the others ranging in warmth according to the amounts of Red or Yellow that they contain.

Color Balance. Warm colors need the balance of cool colors, and coolness demands contrasting warmth. Each one in the circle has its complementary color which is its exact opposite or perfect contrast.

What is the complement of Green? Green is made of Yellow and Blue, so Red, being the only remaining primary color, completes the circle and is its *complement.* Naturally they lie at opposite sides of the circle. Each color is opposite its complement.

Grayed Colors. A mixture of two complementary colors produces Gray. Mix Red and Green to make a neutral Gray—one in which neither color can be distinguished—and fill the small center circle with this Gray.

Make a Gray-Red by mixing Green with Red and fill the space between Red and Gray. Again mix Red and Green but let Green predominate, and fill in the space between Green and Gray with this half intensity of Green. Continue around the circle making these grayed colors or half intensities to place between the colors themselves and the neutral center.

Color Harmonies. Color schemes for practical use are selected in several ways. *Monochromatic* harmony is composed of two or more values of one color. *Analogous*

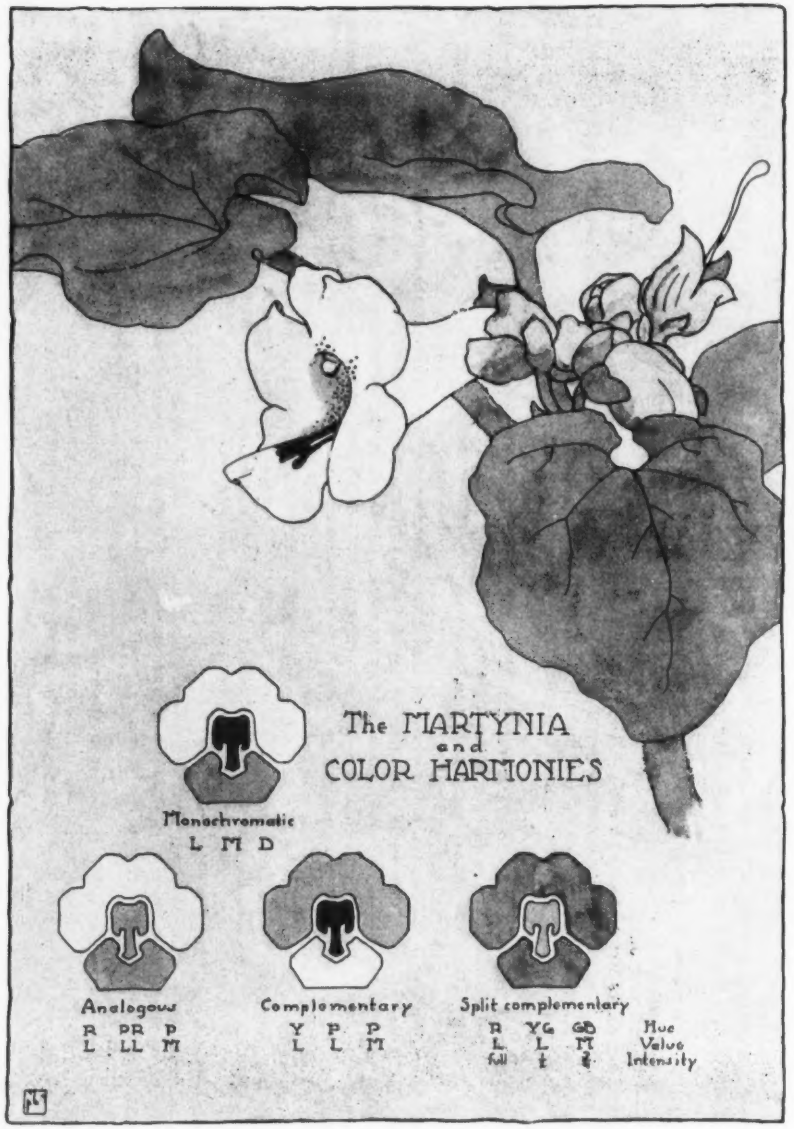


PLATE 15.

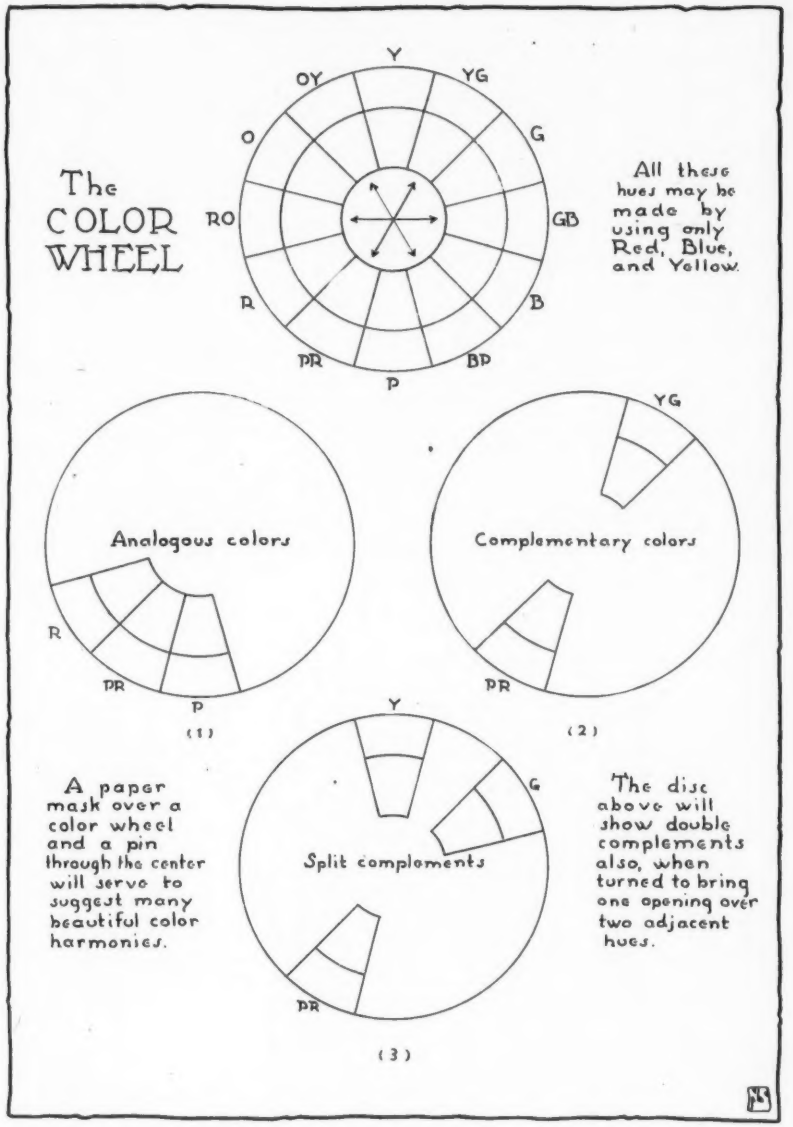


PLATE 16.

harmony is a grouping of any closely related colors. *Complementary* harmony is a balance of opposite colors as already explained.

Masks. If a piece of rather thin white paper is laid over any color wheel, traced and cut like diagram (1) this disc may be laid on the color wheel leaving any desired group of related colors in view and hiding all others.

Disc (2) is cut to show any two complementary colors, and it is a great help to be able to see these pairs without having the others in view at the same time. Mask (3) shows one color balanced by two opposite hues.

These masks may be turned to any desired position. For instance, if Red is to be used in a design either mask will show one or more colors suitable to use with it, simply by placing the disc so that Red occupies one of the cut out spaces. The subdued colors help to bring about harmony and here is a good rule for their use:

Large areas should be in grayed colors with small areas bright and lighter in value.

The possibilities are endless and this simple mask device will suggest pairs or groups of colors that may be developed harmoniously in various proportions, with different values, and in different intensities.

Appropriateness of Color Schemes. The color wheel is a complete unit containing every color in the rainbow. Some designed objects, however, are planned to supply certain color in a larger unit, as for instance, a sofa pillow may supply a brilliant color note needed in a room of subdued harmony, or a table-cover may be in subdued, cool colors to harmonize with a richly hued lamp; or a tie, ornament or handkerchief may give the needed touch to a costume.

Sources of Inspiration. Artists have their favorite colors and it is a profitable study for us to determine the color schemes in famous paintings and in other works of art. We often find simple complementary colors predominating, split complementary arrangements, double complementary—where a second pair supplements the first, and compound arrangements.

Nature is one of the chief sources of color inspiration. Beautiful examples are always to be found in flowers. For formal design the colors should be appropriately conventionalized to conform with their new purpose. Therefore the flower colors are not usually applied in naturalistic brilliance which would be out of place in most decoration.

In the general use of color it is well to remember this guiding principle:

An effect of refinement is produced by the use of subdued colors with jewel-like accents of brilliant contrast.

Problems of Administering Cooperative Classes

F. A. R. Hoffeditz, Director Cooperative Industrial Department, High School, York, Pa.

WHAT relation do your cooperative students have to the high school? Are they a part of the whole plan, or are they more or less segregated? Any high school having cooperative part-time work has faced such questions in answering some of their administrative problems.

The cooperative part-time work for industrial trades was instituted in the York high school in 1911; the first class graduated in 1914 and, including the school year of 1924-25, there are 446 graduates of the department. The work was started as one of the courses in the high school and is still functioning on that basis. Our high school is a cosmopolitan high school, co-educational and organized on the eight–four plan. Our enrollment in 1924-25 was 1,947 boys and girls, while 437 of the boys were listed as "industrials," which is close to one-half the boys enrolled. With almost one-fourth the enrollment having the part-time program in mind, what school activities may they engage in, and what relations have they to the whole group?

Our program calls for the first of the four years to be spent full time in school. If school work is satisfactory, the boy is considered as eligible to be sent to work with some local industry as an apprentice. After this step has been taken, his school time for the remainder of the four years is to be two weeks in industry and two weeks in school. Of course, there are two groups and they alternate between school and shop.

It has been one aim of those who organized this work to make no distinction between "industrial" students—as we call them—and those in any other group, so far as school activities are concerned. An industrial student in the first year may engage in any of the activities available for his classmates in other courses. Needless to say, the students in the various courses are grouped, and not mixed, so far as class work is concerned. In regard to extra curricular activities, these boys are considered on a par with all others.

A common condition is to find comparatively few of the newest class in any of the extra-curricular activities. So, it is only natural for these boys to become interested in athletics, or school organizations, sometime during the sophomore or junior years. By this time the part-time alternating schedule is well under way and the boy finds himself somewhat hampered. This particularly applies to football practice. During the two school weeks the "industrials" can appear the same as other students, but during the two weeks of shop work they find themselves expected to remain at work till five and often six o'clock. We are appealed to quite often by the boys to help them out of this difficulty.

Our position may be expressed this way: The school will bar no student from any school activity he may wish to engage in, provided that activity doesn't interfere with the work, outlined in the course. This is only another way of saying that the boys may have their cake but we will not permit them to eat it. The boy is advised to consult with his superiors, at his place of employment, to ascertain if they will excuse him at four o'clock for practice. Quite a number of the shops grant this privilege to the boy who has been doing commendable work for them. Often when in doubt, they will consult with the school before answering a boy's request. The plants granting this concession are in excess of those refusing it; however, it has not been necessary for all of our cooperating plants to be asked the question because the boys working in them do not wish such a privilege. This then is the reason we find "industrial" boys on the football team, and also in practically all other school activities to which boys are eligible.

We have the usual list of school societies for personal betterment, supervised by faculty advisers. Of the five older societies, two are for girls exclusively and three are for boys. One of the boys' societies is composed entirely of those enrolled in the industrial course, to which boys in other courses are not eligible. We usually have a few "industrials" in each of the other two societies.

This same spirit pertains to student dramatics, orchestra, band, basketball, track, athletic council and class organizations; while we are not likely to find "industrials" on the editorial staff of the weekly school paper or in the vocal music class. When one compares the content of the course and the types of individuals pursuing the work, we need not wonder that we do not find them in the two last named activities and, indeed, have to wonder that we do find them in all the others.

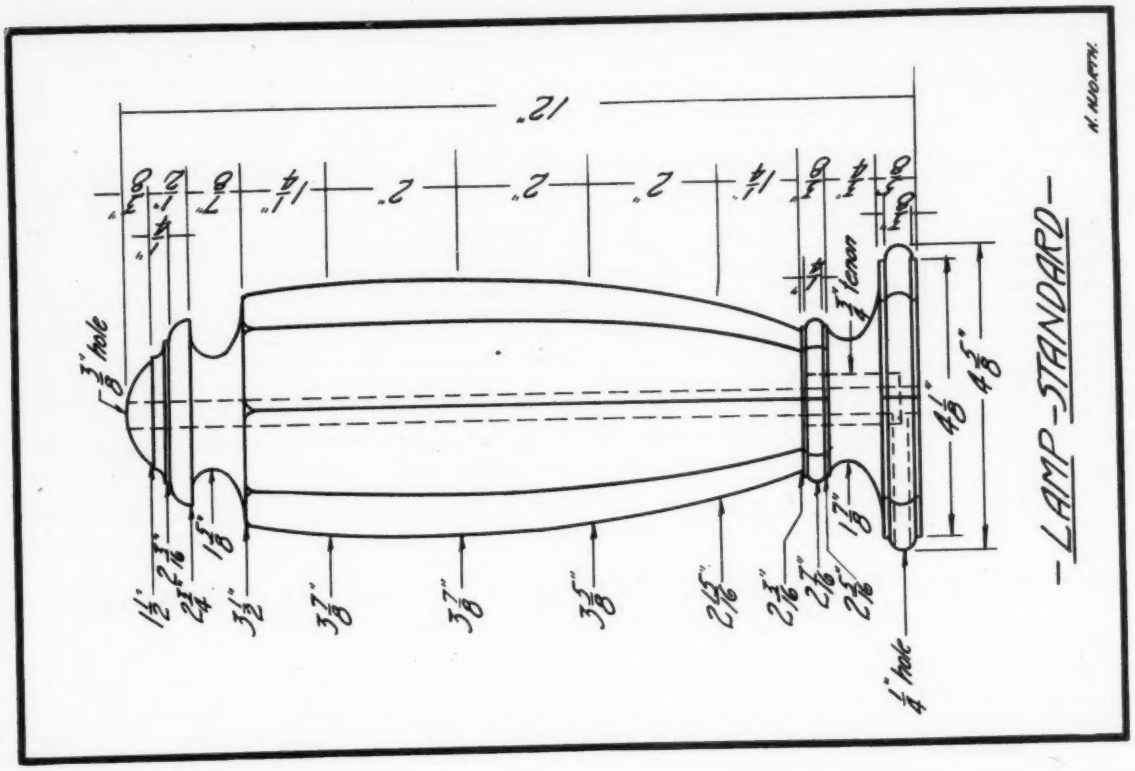

-LAMP-STANDARD-
H. NORTH
12"
2"
1¼"
⅞"
⅜" hole
⅜" tenon
4½"
4⅝"
¼" hole

FIG. 2A.

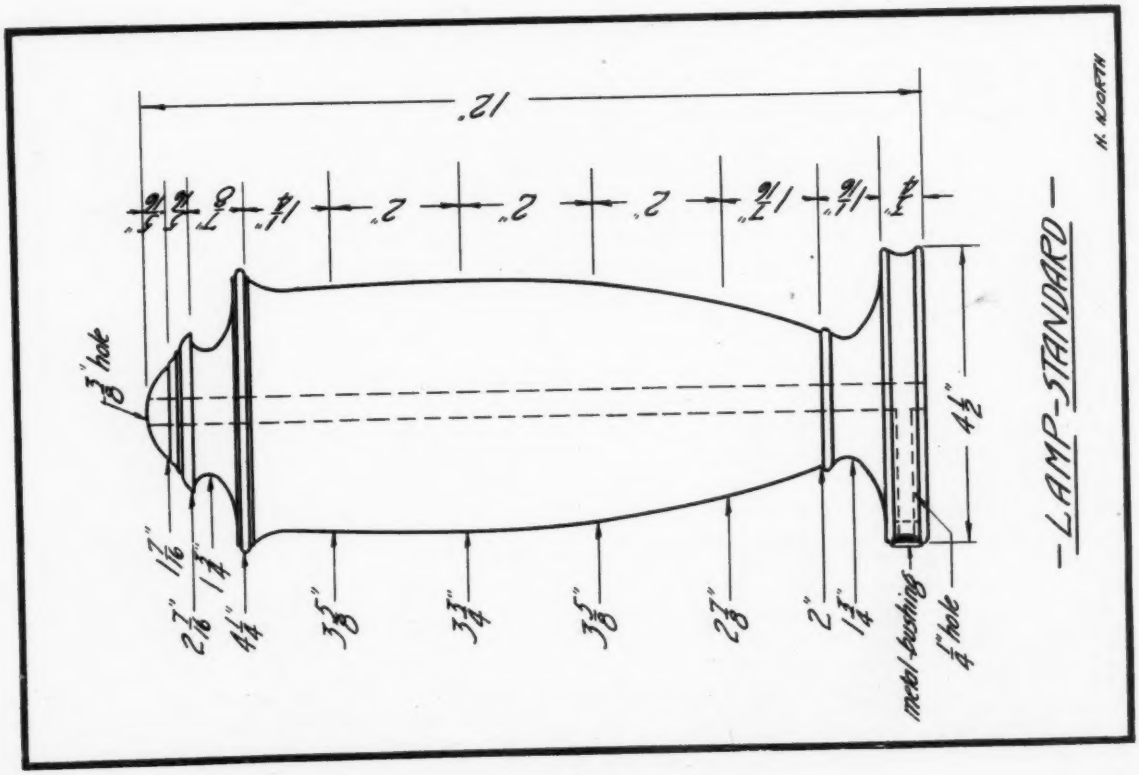
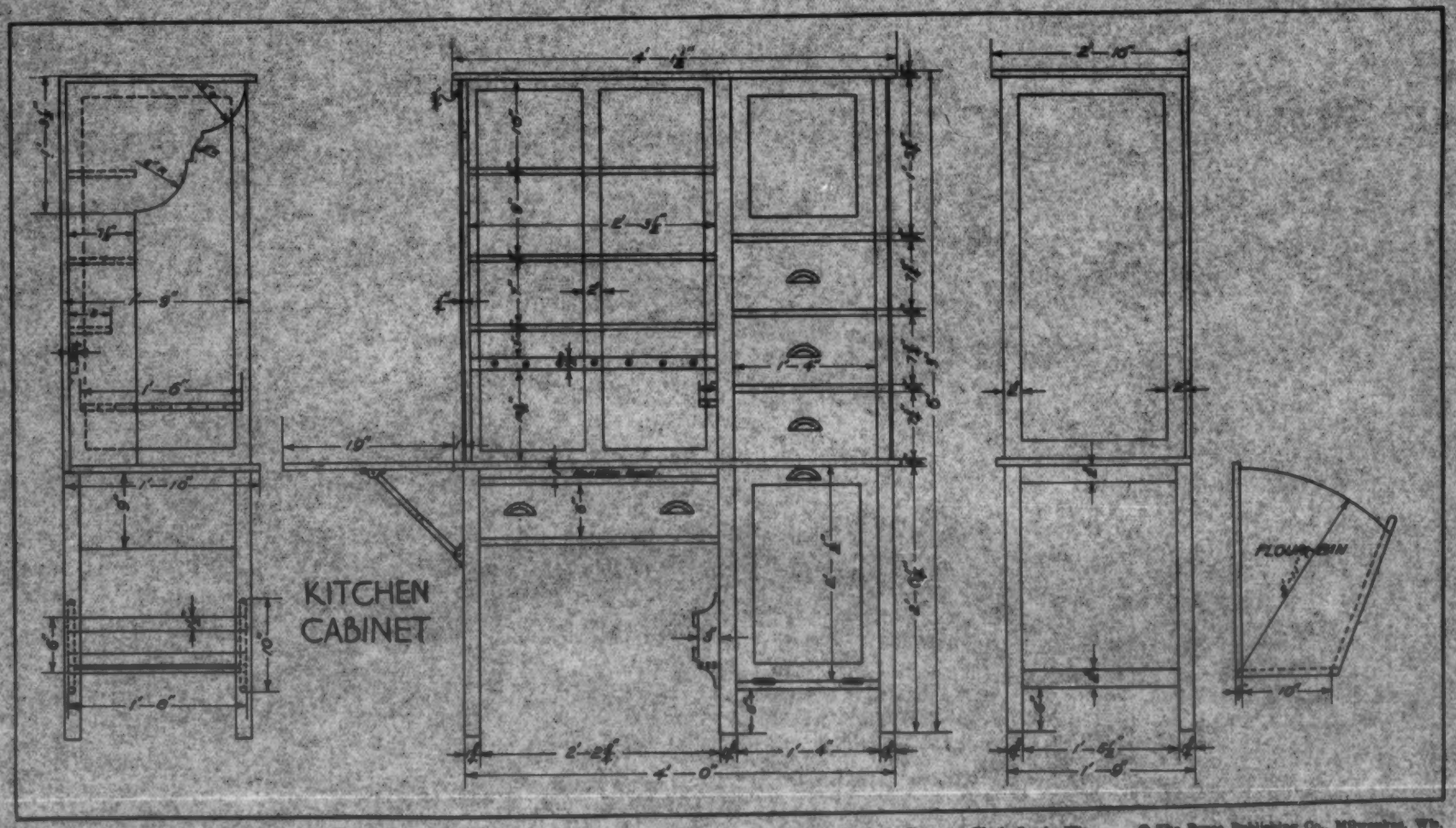

-LAMP-STANDARD-
H. NORTH
12"
2"
1¼"
⅞"
⅜" hole
metal bushings
4½"
4" hole

FIG. 1A.

TRACING SUPPLEMENT No. 1.
THE INDUSTRIAL-ARTS MAGAZINE.
JANUARY, 1908.

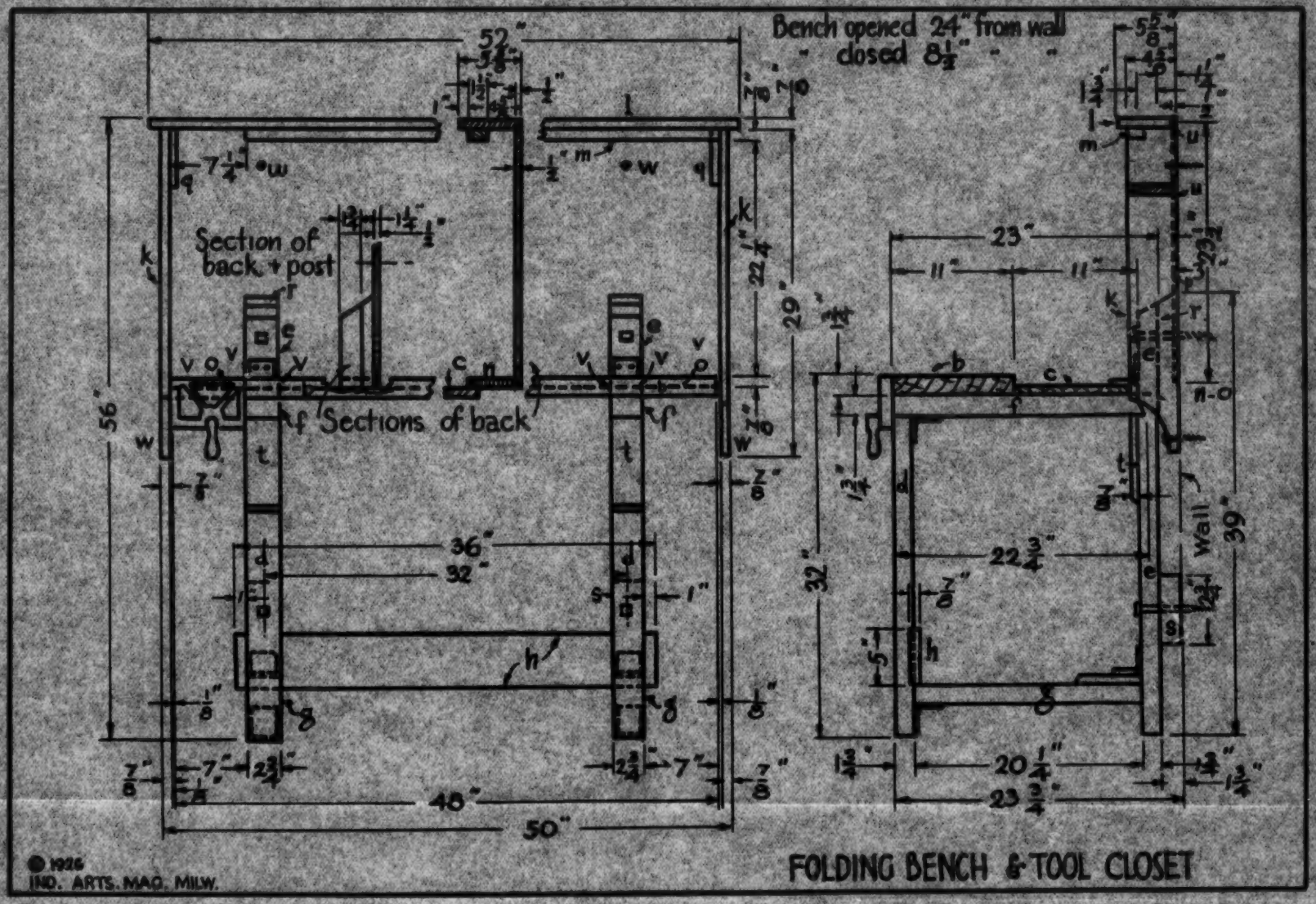
Printed on Tracing Paper for Blue Printing.



Description and Bill of Materials will be found on Page 53 of the Industrial-Arts Magazine, January, 1908. Drawing by C. A. Brenner, Black Creek, Wis. © The Bruce Publishing Co., Milwaukee, Wis.

TRACING SUPPLEMENT No. 2
THE INDUSTRIAL-ARTS MAGAZINE
JANUARY, 1926.

To be Incorporated for School Shop Use Only.



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IND. ARTS. MAG. MILW.

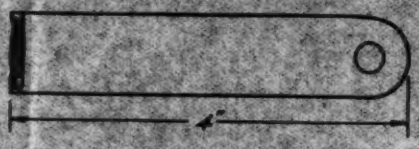
FOLDING BENCH & TOOL CLOSET

Drawing by C. A. King, Plymouth, N. H.

For Details see Page 84, Industrial-Arts Magazine, January, 1926.

To be interpreted for School Shop Use Only.
© 1923, Bruce Publishing Co.

Read instructions carefully and understand what you are to do before beginning work. Have your work examined by the teacher after each operation and before beginning the next. Return this print to its place at the end of this period.



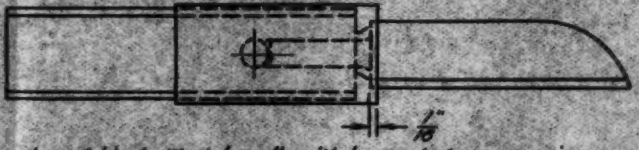
1st Operation.
Use a worn-out power hacksaw blade. Grind off teeth. Grind nicks in both sides and break to length.

2nd Operation.
Grind one side bright, avoid finger marks. Wet bright side with copper sulphate solution. Scribe outline of pattern on coppered side.

3rd Operation.
Grind to line and sharpen.

4th Operation.
Grind shank bright on both sides. Tin shank all over.

5th Operation.
Chuck handle. Drill end hole, turn dovetail. Drill cross hole. Break corners with rasp.



6th Operation.
Insert blade. Wrap handle with heavy paper, covering cross hole and extending 1/16" past shoulder of blade, tie tightly with twine. Hold upright in vise and fill paper collar with babbit.

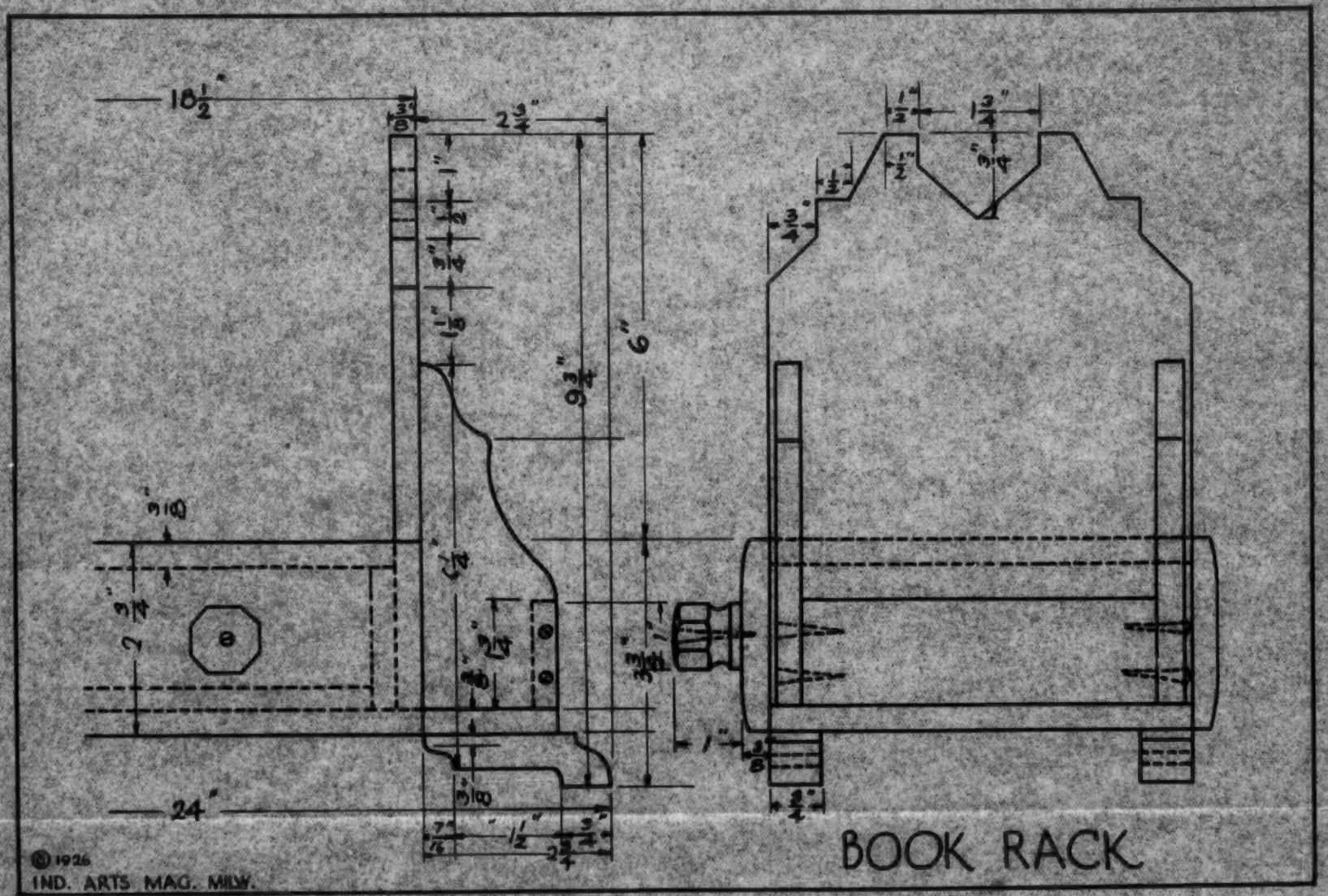
7th Operation.
Chuck blade between two jaws of combination chuck, support handle with dead center. Taper-turn handle.

8th Operation.
Cross handle to thickness, large end 3/8", small end 1/4", with rasp. Smooth and round corners with sandpaper. Soak in raw linseed oil. Dry and clean.

Poring Knife.

Drawing by J. G. Childs, Sheboygan, Wis.
For complete details for making this Poring Knife, see Page 32, Industrial-Arts Magazine, January, 1924.

To be Reproduced for School Shop Use Only.



Designed by A. C. Trendt, Sioux City, Ia.

Details of this Book Rack will be found on Page 84, Industrial-Arts Magazine, January, 1926.

We have gradually built up the plan until our "industrials" are a part of the organization and not a necessary evil, nor do we consider that only those who cannot profit by any other courses are enrolled in this one. The cooperative idea is holding more boys in school, so we might think of it as taking our educational system out into industry.

Each year when comencement approaches, the principal's office announces the fifteen honor pupils. This year these fifteen were chosen from 283 girls and boys, which number included 59 "industrials." Of the fifteen this year, two were "industrials" and one of the two won the second honor, or salutatorian, and he a machinist apprentice at one of the local plants.

Lamps

Herman Hjorth, Director Baldorioty de Castro Technical School, San Juan, Porto Rico

It would be hard to find any piece of furniture or appliance that would be more necessary in the household than a lamp. From the earliest times people have used lamps in one form or another. They may have been of exquisite design as those used by the ancient Greeks, they may have been gaudy or clumsy kerosene lamps, or they may have been only pine torches. In each case the lamp has served a most useful purpose, but not always an artistic one.

To combine utility with art is at present one of the outstanding aims of many modern industries, and with this idea in mind the following designs are submitted. As electricity has now almost wholly supplanted any other form of lighting in the civilized world, it follows that the lamps described in this article have been designed for that young giant of modern utilities—electric service.

The designs of the table lamps have been suggested by designs in Ceramic for a similar purpose and are therefore somewhat different from the ordinary table lamps made of wood. The problem is peculiarly suited to the Junior high school where the industrial work is organized on the general shop plan. It not only involves a good many technical processes, such as turning, planing, finishing, wiring for electricity, soldering, etc., but should also bring out many interesting relationships with other subjects, such as: history, civics, art, mathematics, geography, literature, etc.

The lamp standard, Fig. 1, is turned from one block of wood, which should be about 5" square and 13" long in the rough. Before putting it in the lathe, a hole ⅜" in diameter should be bored through it. On account of the length the hole will have to be bored half way from each end. A good way to do this is to mark the center of each end carefully, fasten the block in a vise and have two boys, placed at right angles to each other, watch the one who does the boring and advise him whenever the auger bit is not in a plumb line. An auger bit having a spur for end boring must be used, as the ordinary kind clogs up and will not take hold in end wood. After the block has been bored from both ends, it will usually be found that the two holes do not meet exactly in the center. This defect, however, can easily be corrected by heating a ¼" iron rod until it is white hot on one end, and then run it through the block. Sometimes several heatings are necessary. The rod should be introduced in the block from the end, which is to be the base of the finished lamp standard, as the hole near the top otherwise will be increased in diameter through burning and be too large for the little piece of brass pipe, which is later to be inserted.

The block is now put in the lathe. The hole in the upper end will fit over the cone shaped dead center, but the hole in the lower end must be plugged, so that the prongs of the live center can get a good grip. After the block has been rounded to its largest diameter 4½" and the lines for further turning marked off with the dead center as the starting point, the hole in the side of the base should be bored. The reason for boring this hole at this stage is that the end-wood of the base is very likely to split if the hole is bored after it is turned to its final shape. After the hole is bored, the two beads and the groove in the base should be formed and sanded, after which the little brass bushing should be driven into the hole.

FIG. 1.

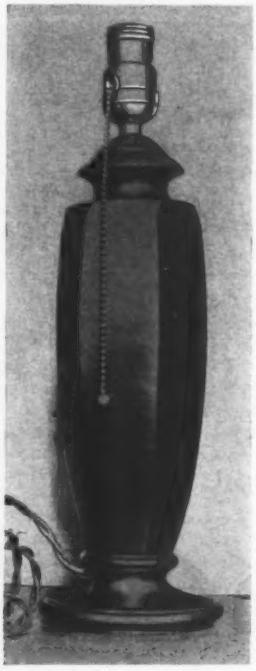


FIG. 2.

This bushing is made from a brass nipple like the one shown on the detail sheet. It can be bought in a 5-and-10-cent store or any store selling electrical supplies, and is prepared in the following way: The threads on one side of the bead are sawed off with a hack saw, the remaining piece filed and smoothed with a piece of emery paper, and the sharp edges of the hole rounded just a little to prevent them from cutting the wires, which have to pass through it. The bushing is now ready for the lamp standard and may be driven into the hole in the side of the base with light blows from a mallet. The turning of the block can them be completed; and if it is going to have a water stain it is well to wash it once or twice with water, and sand it smooth while it is still in the lathe. Care should be taken to undercut the base just a little to make sure it will stand well on a table.

When the standard is completed a piece of ⅛" brass pipe, two to three inches long and threaded on one end, should be produced. If it cannot readily be obtained, a "goose neck," which is a piece of bent brass pipe threaded on both ends, may be bought from a dealer selling electrical supplies. The straight part of it may then be sawed off and used. This little piece of brass pipe is now driven into the hole at the top of the standard with a mallet until only the threaded part projects (see detail sheet). A fixture as illustrated on the same drawing may be screwed to the pipe and the wires pulled through. Six to eight feet of wire is usually sufficient. Such fixtures may be bought with outlets for two, three, or four lights as desired.

FIG. 3.

The shade, which may also be made in the shop, is held in place by the brass knob on top of the fixture. A piece of velvet or cloth glued to the base, makes a nice finish for the standard, and prevents it from scratching or marring the surface of the table, on which it is to stand. Be careful to put the glue on the base only and not on the cloth or velvet.

The lamp standard, Fig. 2, is made in two pieces joined together as shown on the drawing. After the hole for the wires has been bored in the upper piece, it is turned to the dimensions given with a tenon on its lower end, which fits into a corresponding mortise turned in the base. The upper piece is then planed so that six or eight sides are formed. This can be done very easily in the following manner: While the piece is still in the lathe wrap a piece of paper around it on its thickest part and cut it so that its ends will just meet. Divide the strip into the required number of parts, for example six or eight, wrap it around the turned piece again and lay off the divisions.

Various methods may be used for marking the lines from these divisions. A surface gauge, such as machinists use, will do the work. A spirit level held horizontally against the piece, while it is still in the lathe, can also be used, and a box, in which the piece can be held on two points, nails or screws) on opposite ends, will be found very convenient. In the latter case an ordinary marking gauge is employed for marking these lines. This process is more fully described in the author's book "Reproduction of Antique Furniture," pp. 35-37.

The standard is now planed until the six or eight sides, as the case may be, are formed. After the vase has been turned, it may be shaped to a corresponding number of sides, but as this involves considerable handwork, which must be very carefully and accurately done, the base may be left round as shown in the photo. It is best to glue the two pieces together in the lathe, while the base is still on the face plate, because they can then be pressed firmly together by means of the dead center in the tail stock of the lathe.

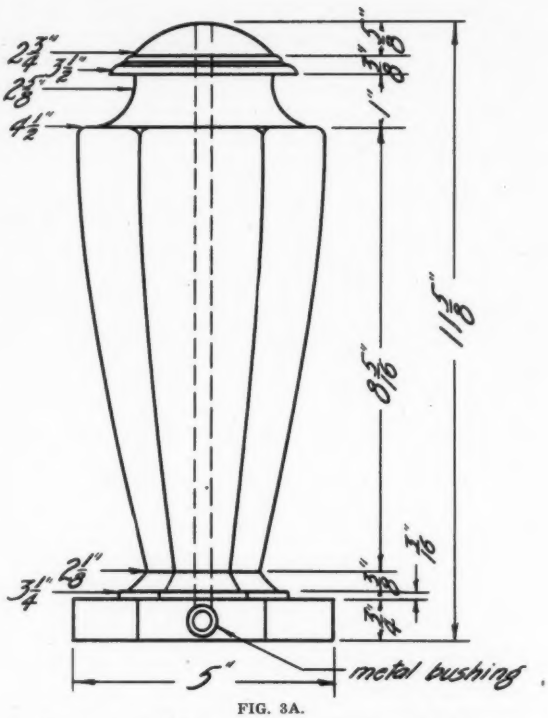


FIG. 3A.

The lamp, Fig. 3, is made in a similar way. The base is built up of three pieces, which are first turned to the required diameter and then planed to form six sides as shown. The lamp illustrated in the photo was made of Satinwood and Mahogany.

Posters for School and Shop Use

Floyd L. Allen, Principal, Arthur Hill Trade School, Saginaw, W. S. Michigan

The administrative problems of a shop or school may be lessened by the use of bulletin service. The efficiency of each department may be greatly increased and a teacher may put an additional "punch" into his work by this method. Shop instructors may, by the use of short "peppy," or "snappy" messages printed upon small cards and posted on a bulletin, put across safety first aids, teach fundamental principles or get at difficult problems.

The best way to convey what I have in mind is to give a list of topics used in connection with the work at the Arthur Hill Trade School. While, to the average teacher, these little topics may seem simple, yet each delivers a message to some student in the school. If, somewhere down the line of students, a few boys or girls pick up a worth-while suggestion, or learn a fundamental principle, then the teacher or principal using this form of instruction may count his efforts as worth the energy put forth. The following list was tried out with the students of our school and, much to my surprise great interest was shown on the part of students that most needed the type of instruction I was trying to get at.

1

STOP!

Thru Traffic.

Watch this space each day!

2

STOP! LOOK! LISTEN!

This is not a R. R. crossing.

BUT

You may avoid many accidents and much trouble by watching this space daily

3

This space is reserved for
YOU
&
THE SILENT TEACHER.

Give him your attention and increase your marks, earning power, physical condition, social standing, etc. Consider his teachings and you will avoid many accidents and much trouble along the road of life.

4

THE SILENT TEACHER.

You are learning a trade.

The progress you make depends upon the amount of energy you put into your job.

The progress you make when you get out into the shops will depend upon your effort.

If you succeed here, you will make a good tradesman.

You must not only learn your trade but you must learn how to work.

5

THE SILENT TEACHER.

Avoid wearing loose fitting clothing, jewelry, or gloves in the shops.
Oil and make adjustments on your machine before throwing on the power.
What does it mean to be cautious?
Protect your shopmates, develop habits of caution.

IT PAYS.

6

THE SILENT TEACHER.

Do you know that your time is valuable?
LEARN how to use it—how to save it.
Time saved and invested in gaining more information regarding your trade or chosen occupation will pay greater dividends than Gilt Edge Bonds.

7

THE SILENT TEACHER.

Is your attention on your job and machine?
Accidents happen to both you and the machine when you forget what you are doing.
Men without fingers, machines without gear teeth are as a rule the result of lack of ATTENTION.
Watch your work.
Watch your movements.
Watch your machine.

8

THE SILENT TEACHER.

The taxpayers are putting you through school.
Do you junk your work?
Do you junk your time?
Do you junk your supplies furnished?
Do you junk the time of others?

IF YOU DO
SOCIETY WILL JUNK YOU.

9

THE SILENT TEACHER.

It is no disgrace to work with your hands.
Good hard work is something we all should like.

BUT

It is a disgrace not to take advantage of what the schools and shops offer, and be classed as a skilled workman along some line.
Are you going to be proud of the way your name appears in the city directory?

IT IS UP TO YOU.

10

CAN'T is a word that won't get you anywhere.
Don't even think in terms of CAN'T.
What foreman wants to spend half his time trying to find something you can do.

You are out of luck
With
CAN'T
As
A
"Buddy"

11

THE SILENT TEACHER.

Some students think in terms of SLANG.
So can we.
"Bunk" is what you try to get away with.
You offer excuses because there is "Nobody Home."
"JAZZ" up the old shop tools if you like but it is the

STEADY GRIND THAT COUNTS.

12

THE SILENT TEACHER.
More Slang

Are you a "Put something over"
OR
A "Get by"
Maybe you tried to
"Hand him a line"
If you have or did then your employer or teacher is a
"Get next"
OR
"Got your number."

13

THE SILENT TEACHER.

Success is not determined by holding down a job or receiving a good pay check.
WHEN you make your services so valuable that the plant cannot afford to let you leave them, when the younger employees ask your advice, when the management seeks your counsel, then you have commenced to reach the top of the ladder.

14

THE SILENT TEACHER.

A good mechanic is not always a good tradesman.
You must work in harmony with your fellow men.
You must always work for the best interests of your employer.
Forget yourself for eight hours and remember you are part of THE PLANT.

15

THE SILENT TEACHER.

If you can't see the use of guards on machines put yourself in the place of the boy who tears his coat or shirt sleeves off on the big lathe.
OR
The boy who tries to trim his fingers on the grinder, sander, or jointer.
Or
The boy who gets "Knocked Flat" when playing with the switch.
YES—these happen in every shop.

16

THE SILENT TEACHER

Learn to put away your tools.
Learn to clean up your machine.
Learn to economize on supplies given you.
Learn to be responsible for all of your job.
Learn to respect the rights of others.
Learn to work in harmony with your fellow students.
LEARN TO BE CAREFUL.

17

THE SILENT TEACHER

Does time drag on your hands?
If so it is a danger signal.
You are out of step.
Find out why!
You have an honest-to-goodness problem to work out for yourself.

18

THE SILENT TEACHER

We all take pleasure in thinking of the big thing we are going to do.

BUT FELLOWS REMEMBER!

It is the little things that count.
They are the real help you will need to accomplish your aim.

While no great variety of these cards, as yet, has been worked out, enough have been tried to know that each teacher in every department of any school could enrich his course by this method. Each and every teacher has his own ideas that could be worked into this form. Once these are put into shape for display, teachers will get a lot of satisfaction out of the results. The samples of posters listed are not intended to develop any particular topic but were used simply to discover if any interest would be shown. I am giving you the idea as it worked out in my mind.

The plan for use is as follows:

1. Cards worked out one for each day.
2. Posted in a conspicuous place where they can be easily read by all the students.
3. Attention called to the topic of the day.
4. Questions asked regarding the topic of the preceeding day.
5. A check on results about every three days.

Posters may be made more attractive by the use of illustrations. A little extra work here will pay. Just a few minutes each day developing topics and you have an additional "punch" to put into school instruction. TRY IT!

INDUSTRIAL-ARTS MAGAZINE

E. J. LAKE S. J. VAUGHN

Editors

HOW MAY ART COME INTO ITS OWN?

Under this title the October number of Everyday Art tells us that four times as much home economics, music, commercial work and manual training is taught in our public schools as there is art. We have heard and read strong evidence presented by thoughtful school people in favor of the idea that a school subject stands or falls by virtue of public sanction, rather than by the sanction of teachers. Art has never been a popular subject of school instruction, except with those who felt that they had natural ability for it.

We surmise that before drawing and design will be elected by great numbers of children as a necessary school study, they must be convinced of the value of it in their individual development. The idea persists with parents and pupils that they go to school to learn definite facts, and to acquire skill in doing definite things which are necessary in later life. Satisfied that art will give them understanding and skill of a practical sort, the subject will be demanded rather than tolerated.

The problem of establishing art in the schools is the problem of teaching definite facts of form and color as applied to the needs of everyday living and the training in craftsmanship, which will make each individual skilful enough to choose and use the commodities of living. This has not been done as yet. It may never be done so long as art, as a school subject, is conceived and impressed as a creative individual accomplishment.

That there is a content of information and precept in graphical effect as applied to social and commercial interests, no teacher of art can deny. We know that balance and harmony in design are secured by definite methods. We know that forms and colors can be used with definite results. We know that lines, shapes, tones, colors have distinct effects as applied to definite purpose. Why not teach these things in school under the name of art until a better name can be applied to the purpose of developing the appreciation and skill in visual effects that everyone must experience? Why confuse our purpose with philosophy of esthetics and personal impressions that are beyond the pupil?

The teachers and champions of art in the schools may take courage from the conclusion that no school subject would have persisted, if taught by the haphazard methods employed in art instruction. We have attended open sessions of grade schools where classes of small children could read simple music readily and sing from the printed notes with accuracy. Orchestra and band and chorus music is fairly well interpreted and executed by upper grade and high school pupils. These demonstrations impress parents and children as a distinct accomplishment, and there is no one influence more effective in the establishment of school instruction than the evidence of good class instruction.

Instruction in drawing and design has rarely resulted in such evidence. In exhibits of school work in art, it is not unusual to find the same project attempted in the lower and upper grades with no evidence of improvement in conception or execution. Indeed a certain careless manner of execution is often evident in upper grade and high school work, as a result of the attempt to imitate the mannerism of a popular artist. A sense of proportion and placement, understanding of cause and effect in the arrangement of forms, knowledge of direction, size, scale, the orderly habits that can only result from thoughtful, careful, and persistent drill will result in good school art work. Such a premium has been put upon the incidental effect produced by chance that even the lower grades have their prodigies.

Teachers have been bold to confess that this or that child draws better than they. Children reach the conclusion in the early grades that they have no talent for art, and adopt a fatalistic attitude toward the subject. A majority of high school pupils have the idea that art is a mysterious gift. Many teachers and most parents have the same idea, and with it the conviction that time spent on the subject is time wasted except for the elect. What school subject can persist under such conditions?

We believe that these conditions can be changed. We believe that the study of visual effects may be formulated into a teachable, learnable school course, that will develop interests and abilities that are not developed by other school subjects. We believe that if the subject reaches a point of near neglect as it seems to be at present, it will persist as a school subject, because it is essential and fundamental in the development of humanity.

The Federated Art Council should have the support of every person who is interested in education.

THE PROPOSED CORNER ON INTELLIGENCE

Michigan University's new president, Dr. Little, in his inaugural address, pointed out some glaring defects in our educational institutions and made some timely and pertinent observations and recommendations with reference to them.

Some of his recommendations, however, while correcting certain difficulties, would leave unsolved a more serious problem than the problems solved by the recommendations. For instance, he proposes that universities shall in advance of registration cull out only the superior students for entrance to the universities. This is all very well and good, perhaps, for the superior students, although there is at least a serious question about it, but Dr. Little advances no plan or suggestion as to what is to be done with those multitudes of students who are not superior in intelligence. His proposal helps to solve the university's local problem of housing, management, and instruction, but it does not aid materially in the colossal problem of universal education in a democracy. While dominating the educational world,

the university would thus shift to other agencies the education of the masses of our population, and the education and guidance of the masses will always be the major task of society. It is well and good to produce leaders in universities, if we do, but leaders will never get very far in a democracy, cut off from the masses without an educated lot of followers.

There are no accurate means of testing or determining many of the essential character elements besides intelligence. For good citizenship and the welfare of society as a whole, superior intelligence alone is not a safe guarantee. It is not certain at all that a better type of citizenship will be developed by the university that confines its efforts to the people of highly superior intelligence than the type that comes from the large, democratic group in the present institutions who show good average intelligence and above. Even if it should be so, the problem would still remain with us of trying to educate the multitudes that the universities would refuse under the proposed plan.

It is not enough for the university authorities to formulate a plan for the elimination of the vast majority of young men and women from the institutions maintained by public taxation. It devolves upon them at the same time to formulate plans for the proper education of this vast majority who are to be excluded from this intellectual aristocracy.

EXPANSION INSTEAD OF RETRENCHMENT

Some strange contradictions get into the public mind. Just now when the whole world is disturbed by the restlessness and recklessness of young people, it is a most unfortunate and absurd thing to talk of retrenchment in those lines of school work that most surely are going to be the vital means of remedying the situation.

A generation started to grow up with nothing to do. Home industries had disappeared. Home duties had been usurped or crowded out by the "parlor and" apartment, the gas stove, the electric grill, the vacuum cleaner, the electric dishwasher, the maid, and the ubiquitous janitor. The youth of the land were the "leisure class."

Under such conditions, what is to be expected but restlessness developing into recklessness? On the heels of this condition came the automobile, the movie, the airplane, jazz "music," and the petting party. To add to the confusion, the wave of "sex equality" and the "'rights" of young women to uncontrolled liberty, swept over the whole country. Parental authority in a measure broke down.

The fact is that the youngsters had nothing purposeful and worth-while to do, but they had everything fascinating, adventurous and daring to think about and to do.

What's the solution? Work, business, activity, organization, service, invention, construction, experimentation, adventure in science and industry, RESPONSIBILITY, and PURPOSE.

The shop, the studio, the laboratory, the drafting room, the farm project work, and a hundred different activities developed in the modern school with a modern curriculum will do for the next generation what was tragically needed by this one. If the school day can be lengthened so that many of the hours wasted and worse than wasted under the present regime may be devoted to happy, satisfying, purposeful, and educative activities, a great advance will be made all along the line for the conservation and the proper training of our youth.

It's a little late to start on the present generation, although much can be done even yet for the younger half. But now is a good time to start for a running broad jump into the next generation. There never was a time when the right kind of industrial work in the schools was so much needed. Every possible influence should be exerted by every friend of youth to see that there shall be not only no retrenchment but that there shall be a continuous extension of the industrial work in the schools.

It is a good thing for a pupil to be able to work with his hands; to be "handy with tools"; to experience the satisfaction that comes from making something; to be able to express himself in material form; to measure himself and his accomplishments with standards that tell the exact truth; to know from experience what it is to perform manual labor and so have more sympathy with those who work. Its purpose is to give an all-round training; to make a pupil resourceful, inventive, creative. To do this, however, it must make a strong appeal to the pupil; it must have motive; it must not confine itself to school exercises; it must relate itself to a variety of processes; it must deal with a variety of materials; it must be connected with live problems; it must concern itself with the interests of the home, the school and community from the point of view of making and doing.—Randall J. Condon.

The fundamental difficulty is that the work in which the school seeks to engage the child does not contribute to the solution of any problems which he has encountered in actual life.—H. B. Wilson.

It is hazardous for any one to assume that he can arbitrarily train the boy for any calling that may be selected. The latter's peculiar temperament calls for the strictest consideration, so that the work may be suited to the boy and not the boy to the work. His instinctive disposition and native ability need always to be consulted and their promptings specifically heeded. Every boy is a natural born something or other worth while. To discover this predominant trait, to foster and indulge it throughout the training course, and finally to start the young man upon the life work for which this instinctive desire so urgently calls—this is a condensed statement of the entire problem of the vocational guidance of youth.—Wm. A. McKeever.

Errors in the Use of Common Woodworking Tools—II

Charles A. King, Plymouth, N. H. (See Page 36)

FIG. 5. USE OF CHISEL.
Find two errors in position.
Find two errors in use of tool.

FIG. 6. USE OF EDGE TOOLS.
Find one error in position.
Find one error in tool use.

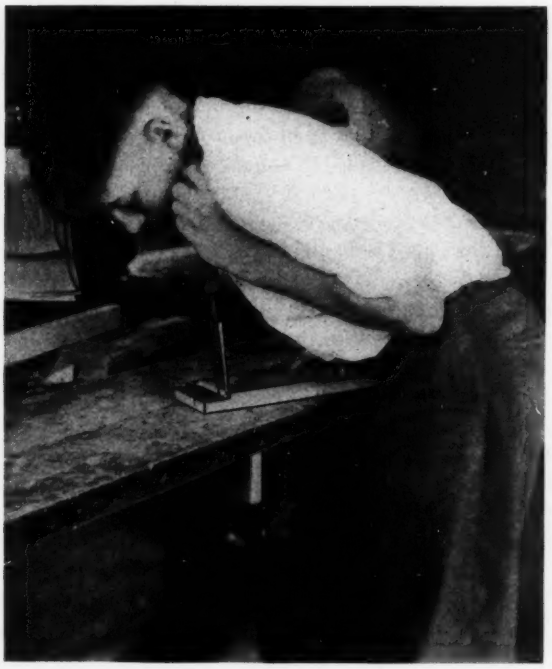


FIG. 7. USE OF CHISEL.
In what way may either the body position or use of tool be improved?

FIG. 8. USE OF A CHISEL IN MORTISING
Find two errors in types of tools used.
Find two errors in the use of tools.

A Project Analysis

John R. Holliday, Richmond, Va.

IN an earlier article[1] I endeavored to illustrate a method of building up a manual arts course on lessons determined by analysis of standard commodities of utilitarian values, drawn from the woodworking craft. These lessons being fragments of an objective unit of construction, are organized into wholes, according to the lesson plans.

In order to make this clear, let me cite an illustration. The aim is to teach, or "put over," the following lessons to one of the lower grades: Shaping wood to three geometric forms, square, hexagon, and octagon; locating centers and boring; chamfering; smoothing and sandpapering; painting, and related information.

The usual practice is to select and design the project through suggestion and discussion with the class. The boys at this point are led to understand that the first and second years of woodworking are devoted to the learning of lessons, so that in subsequent years they will be able to construct some manner of object for which they will find a need in the home. What project, then, will utilize these lesson plans? The teacher may select a ring-a-marble, a ring-a-peg, or a baseball game board. In other words the projects themselves give the content of lessons, which are noted; and value is given for work done per lesson. This method of classwork has dictatorial characteristics which are fatal.

The present paper is an analysis of an objective unit of construction, to determine the richness of the educational content: (a) the lesson content; (b) the deliberative thought movement; (c) the continuitive self reliant-effort.[2]

The Selection of the Project

"Mother bid me ask you to be allowed to make a bedside table," said Tom at the beginning of the school year.

"Are you in need of anything for yourself, Tom?"

"Yes, sir, I would like to make something to hold my own books at home."

"Which would you prefer to make?"

"The bedside table."

"Good, you show an excellent preference. Did you give this any thought during the summer?"

"No, sir."

Tom had been a little indifferent last term, though he did his class work. He was inclined more to play and interfere with the other boys and their work. But the redeeming feature in Tom is that he is very fond of his invalid brother Fred.

"Did your brother go with you this summer to the seashore?"

"No, sir; he was not able."

"Not able, poor boy, to go to the seashore and enjoy swimming, or games, or hikes into the country! Is there anything that he needs, that he would like to own? Where does he keep his reading material, or his tray when eating his meals?"

Tom's face brightened up now as though he had an idea—a bedside table for Fred, and he meant it this time.

"How many in the class would like to make a bedside table? Show by raising your hand." A fair showing. "How many would like a book stand?" Again a fair showing. "The book stand will have to be supported in some manner. How?"

Tom said, "Lets make a table for the book stand, and, we can lift off the book stand when we want to use the table."

So the project selected for those who wanted it, was a bedside table and bookstand.

Project Analysis

(A) *Lesson content.*

1. *Designing.* How do we think it out?

2. *Drawing.* Conventional lines, plans of projection, scale drawings, a broken and section view. Why used?

3. *Specifications of the Table.* Kind of material; lap joint on rails to legs, glued, and fastened with ¾" F.H.B. screws; legs, two pieces glued back to edge; balusters mortised to rails; slats nailed with 1" brads.

Bookstand. Bookstand ends to base, dado joint, glued and fastened with 1" F. H. B. screws; book trough parts to end dado joint; pockets glued to bookstand ends and fastened with 1¼" F.H.B. screws; pocket front glued only; felt glued to bookstand base. Dark oak stain; oak filler; three coats of varnish, rubbing down with pumice stone. Brass handles to bookstand ends; four castors for leg ends on floor; half dozen tray pulls.

4. *Bill of Material.* Reading drawing to determine sizes of pieces; finished and cutting sizes.

5. *Cutting out Material.* Economy in laying out and cutting material; marking each piece; study of the grain.

6. *Squaring Material to Size.* Steps in squaring,—face, edge, end; select best side for face; steps in sizing,—length, width, thickness (revise).

7. *Shaping.* Legs; table top; bookstand base and ends; pocket ends.

8. *Gluing.* Legs, dado joints, balusters, (mortises) pockets; lap joints.

9. *Lap Joint.* Rails to leg, methods of laying out, cutting and fitting.

10. *Mortise and Tenon Joints.* Balusters to rails, method of laying out, cutting and fitting.

11. *Dado Joint.* Bookstand ends, and trough parts; layout, cutting, and fitting.

12. *Smoothing and Sanding.* The purpose of the different grades of sandpaper; the block of sandpaper; rounding arises. Why?

13. *Assembling Table.* (1) Back balusters to rails, (2) rails with balusters to legs, (back); (3) side balusters to rails; (4) sides with balusters to legs, (left and right from front); (5) front top rail, middle and bottom; (6) fastening bearers for slats in position, 1¼" F.H.B. screws; (7) nailing slats to bearers; (8) fixing table top to frame.

Bookstand. (1) Gluing ends of pocket fronts, and fixing in hand screws; (2) gluing dados, trough, shelf, tray rails in bookstand ends, fixing in steel bar clamps; (3) bookstand ends to base, fixing with glue, and 1" F.H.B. screws; (4) glue, and brad on tray slides to ends and back.

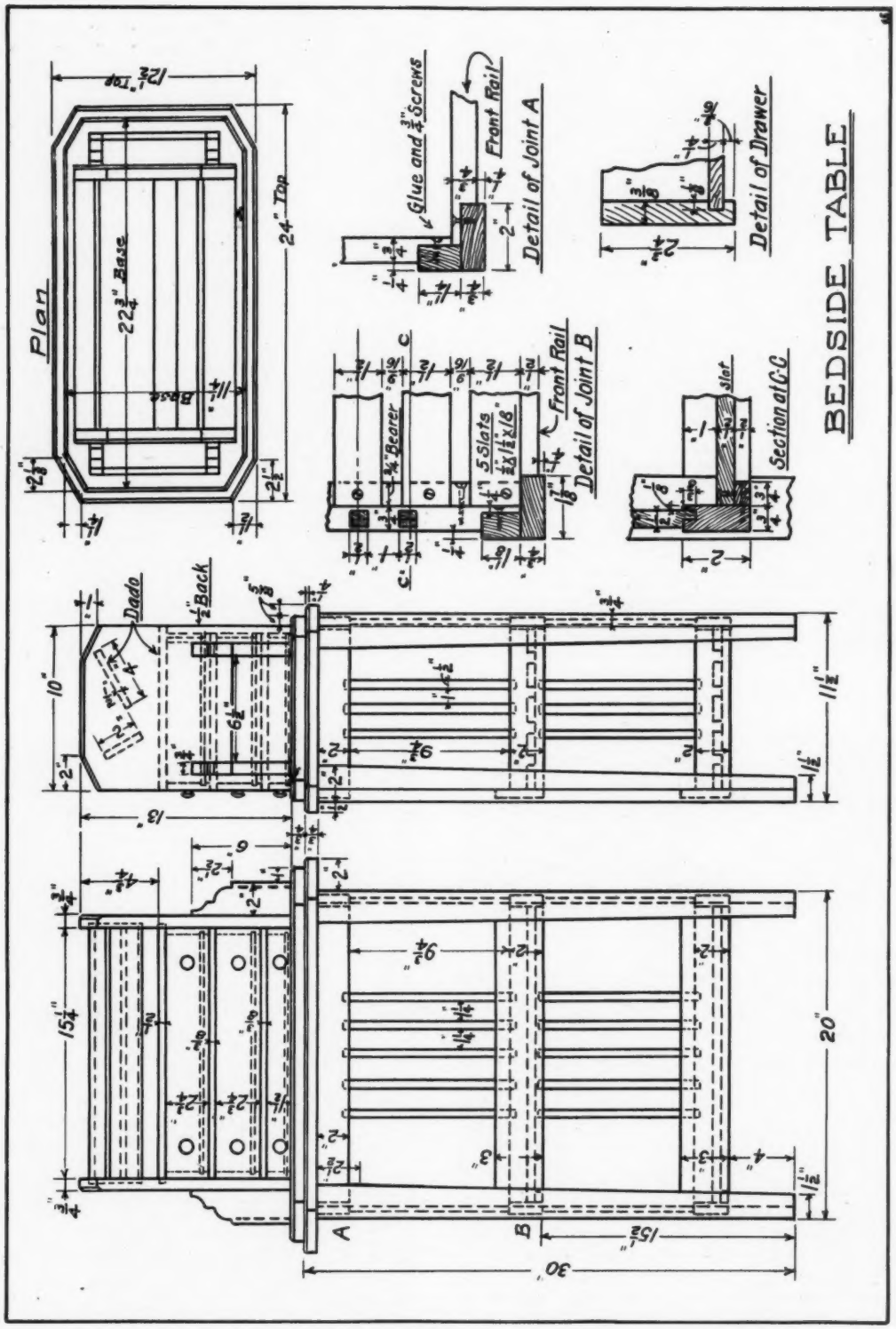
14. *Fitting Tray Fronts.* Drawer construction, grooving, dovetailing. Three ply material, how made.

15. *Staining.* Reason for different kinds.

16. *Filling.* Its purpose and nature. Is filling absolutely necessary?

17. *Varnishing.* The kind and use of brush in applying varnish; necessary conditions for good varnishing; rubbing with pumice stone.

[1] Industrial Arts Magazine, page 96, March, 1925.
[2] Teaching of Industrial-Arts, McMurray, Eggers, and McMurray, page 117.



DETAILS OF BEDSIDE TABLE.

18. *Fixing Hardware.* Handles to bookstand ends, tray pulls to trays, castors to legs, also gluing felt to base of bookstand.

(B) *Deliberative thought movement.*

The basis for a deliberative thought movement is laid first in the devising of the design, where clear, connected thinking and ingenuity are the vehicles for the preliminary plan. He considers the material and determines the kind of shelf for the books, whether a trough or just a shelf. He places the books he wants together and so determines the length of the shelf and trough. There will be a tray to hold his loose photographs, pamphlets, or bulletins. From a magazine article, he got the idea of making a pocket at each end of the bookstand for time tables, for letters to be answered, or catalogues. Where will he put his papers and magazines? How may the space under the table top be utilized? He thinks of the design in the light of its adjustment to the other furniture in his room. He considers the harmony and the proportions of parts with the view to have them fit in. Finally he thinks of the details of construction.

BEDSIDE TABLE.

A careful and deliberate design forecasting and unifying all the subsequent materials and processes in subordination to a purpose, gives the problem its real meaning and life. The constructive problem at its birth necessitates for self-activity the comprehension and combination of the varied elements into a suitable whole.

If we are to encourage and develop self-activity in the boy, let us get away from that kind of benevolence which would prepare the complete design, (the making of a pattern, it may be) and dictate the exact method of procedure.

In our aims as instructors, do we consider this deliberate thought process? Or do we aim only to have a good exhibition at the end of the term? Arthur Dean well observes that "some had rather show a beautifully made model than interest themselves in what the boy got out of it in its making."

The discovery of a need with conditions and resources in sight, the power to form a purpose and its pursuance to the end; definiteness in design and plan will together be the mental stimuli to the thought and constructive sides of the problem; and not only that, it will be the vehicle on which we will evolve toward deliberative thinking and "continuous self-reliant effort."

(C) *Continuitive Self-Reliant Effort.*

The secret of a "continuous self-reliant effort" lies in the practical acquaintance and sympathy with the pupil; appealing to his constructive and play instincts, touching his feelings and ambitions; allowance of freedom and initiative; incorporation of the pupil's thought in his matured design and its execution; guidance of mental and motor efforts to an intelligent end, with corrections through criticisms, and suggestions in giving advice; placing a sense of responsibility on the pupil to solve his own problem in his own way, and suffering no interference.

The accompanying drawing, and photograph of the complete and equipped project provides ample room for the pupil's freedom with the varied details of design and construction. There are problems to be thought out and solved: The laying out of the mortises for the balusters when the rails are of different lengths due to the taper of the legs. How to determine the length of the front rails, and the shoulder cut on the rails for the lap joint, particularly the middle and bottom rails. How and when to rail on the slats in assembling, etc.

To master one difficulty is an inducement to master another, and so on to the desired end of his pursuit. This in itself furnishes an opportunity for the cultivation of self-activity.

If this project is successfully executed, it will probably carry over into the pupil's manhood, and be of use to his altered and enlarged range of intelligence. He will find it convenient to hold his books and pamphlets, or brochures that deal with a favorite intellectual pursuit. It would probably prove a convenient piece of furniture to the instructor in industrial-arts as a receptacle for his favorite books on industrial arts, government bulletins, and magazines to be read.

The making of this project by the instructor for his own use will enable him to appreciate further what "the boy got out of it in the making."

TESTS FOR SHOP COURSES

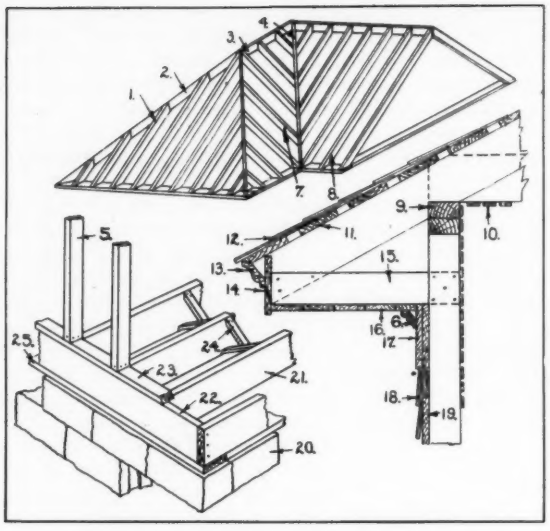
William L. Hunter, New York, N. Y.

Some four years ago a high school superintendent who was very much interested in a program of testing said to me, "Why don't the people in industrial arts get out some tests as the other departments of the school are doing?" Not knowing anything about tests, my answer was, "We don't believe in your kind of tests for our work." He thereupon replied, "I very much doubt the value of a subject in the school curriculum which does not have a large enough body of facts so that these can be classified in some uniform manner, given to the students in some uniform manner, and checked-up on in some uniform manner." I had some time ago agreed in a large measure to his first two points, but his "checking-up" remained for me to ponder over. During the last two years, therefore, some time has been spent by me in devising various tests that would obtain results for shop courses as have been obtained for many of the other school subjects.

The value of a test such as the carpentry test here shown is quite evident to a teacher who will give it in a fair-minded way. Some of these values will be listed.

First, this sort of a test is a time saver. By this is meant the same amount of knowledge can be "checked-up" on in one-tenth the time as is required to give the written test as it is usually known.

Second, this test comes much closer to being fair to the students. Some students are handicapped by their inability to use written or oral English in a manner pleasing to the instructor. Why not use the language of drawing as much as possible? It is very difficult to eliminate all English and it is not advisable to try to do so, but shop teachers as well as others often grade on "flowery language" instead of grading on facts. Certainly, no one would get rid of the written examination



TYPICAL TEST SHEET FOR CARPENTRY.

entirely. It has its advantages but statistics have proved beyond the least possible doubt that it is not reliable as a measure of attainment in a school subject. For instance, a paper from a written examination may be graded by ten teachers, each one grading separately. When the marks are compared a very wide variability is found. It seems that these tests were as much a measure of the teacher's ability to read as it was of the pupil's ability to express himself in written words. The new sort of test is fair in that the paper will be marked the same by all teachers. An answer is either correct or it is incorrect. There is nothing wrong in having the pupils exchange papers and for the instructor to hurriedly read off the numbers which answer each item. Some may say that the papers should be graded by the teacher. They should be checked over, but a boy likes to find out how he tallies up with the rest of the class, and he wants to find out right away.

Third, the newer type of test or examination gives the teacher something to aim at. There is a certain amount of ground in a course that should be covered. This is a recognized fact in some of the other school subjects which are functioning the best and have functioned longest. And we should have more organization in shop work. If a student comes to us from another school and tells us that he has had a course in carpentry, what significance does it have? Can't we, as shop teachers, say to ourselves, "Here is a large number of facts that relate to this shop subject; now let each one of us by common consent list these facts in order of seeming importance from most valuable to least valuable; and further let us take 100 or 200 of those receiving the highest total rating and agree that this is the material that shall be taught." Of course the body of knowledge will differ greatly where the aims of the schools differ greatly, but such a step would be an improvement over the present heterogeneous selection of school shop subject matter. Then, if we could devise some tests to cover this material it would keep clearly before the teacher, especially those less experienced, the desired content of the course and enable him to quickly "check-up" on his teaching.

Fourth, the pupils like the type of test as shown far better than they do the five or ten question type as is usually given. After the test there is a basis for the students to ask questions in regard to any part of the test that they did not know.

Having summed up some of the seeming points of value, it will not be amiss to show some of the possible limitations.

First, one such test for a course is not sufficient. Five or ten minutes every fourth or fifth period is not too much time to spend in "checking-up."

Second, these are not intelligence tests, nor are they tests of skill at the bench, although the pupils who are best with their hands will in most cases be best in the tests. The primary design of the test is to "check-up" on subject matter which the pupil may have gotten from demonstrations, lectures, drawings, or assigned readings.

Let it not be understood that this carpentry test is considered the "*n*th degree" of perfection. It is not. However, it is a step in the right direction. We cannot expect a child that is learning to walk to do a man's work. It is to be hoped, therefore, that gradually each line of shop work will develop a definite system for "checking-up" on the subject matter as shall be presented.

FORGING FISH SPEARS

Jay F. Knowlton, Supervisor Boys' Industrial Work, Hibbing, Minnesota

For those instructors who are working in the inland lakeless cities far removed from the fishermen's paradise; where Isaac Walton never returns for a short visit, to instructors of such cities I am afraid my message will be of little interest. But if you are in a locality where spearing with a jack light is still within the law; if you are of that class of sportsmen who can sit all day in a cold fish house and work a fish decoy and call it fun, then I am sure you will enjoy making your own spear, the instructions for which are contained in the following paragraphs:

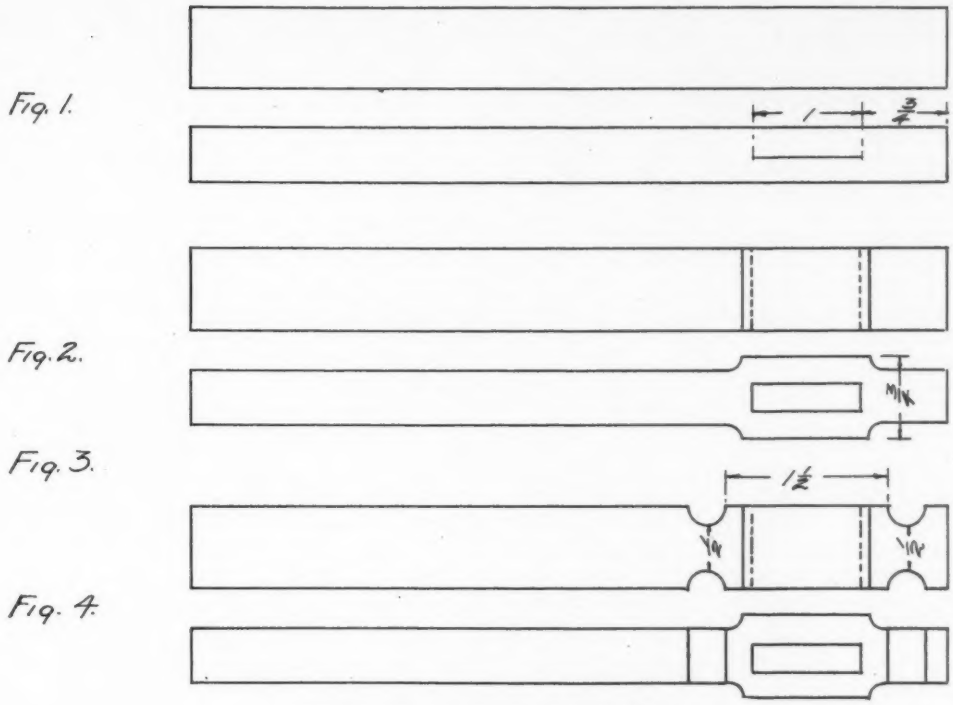
The materials needed for the making of the spear are as follows: Six inches of ¾" gas pipe; seven inches of ½"x¾" mild steel; twenty-eight inches of ¼"x1¼" spring steel; six inches of ¼" round spring steel; a small piece of ¼"x⅝" mild steel for a wedge; six inches of ¼"x1" tool steel for a chisel, and a small amount of welding compound for tool steel welding.

The first step is to forge the ½"x¾" mild steel to shape as shown in Figs. 1 to 5. The first operation is to split the ¼"x1" hole for the spear tines. The chisel for this is made from the ¼"x1" tool steel, as shown in Fig. 6. In Fig. 2, which shows the hole split, it will be noticed that this section of the stock has increased to ¾"x¾" due to the spread while splitting. Now forge as shown in Figs. 3, 4, and 5. The end of this stock that is now ½"x¾" should be forged round to fit the inside of the ¾" gas pipe.

One end of the gas pipe should be placed over the tip of the horn of the anvil and while the pipe is red hot, beveled for one-fourth of an inch. Drive this pipe while red hot on to the ½"x¾" shank, ready for welding. In beveling the pipe, do not make the mistake of trying to draw the edge thin for too great a distance, for most gas pipes are welded and such an operation will cause them to open on the welded line. A slight crack will do but little harm so long as it does not run above the section to be welded. The pipe can also be cracked by being driven over too large a shank for welding.

The welding is not difficult if a little compound is used; if the fire is clean; if the heat is correct and if the pipe is welded square. After being welded square, it can then be drawn eight-sided and round. It is difficult to weld the pipe round; as it is not necessary, it should not be attempted.

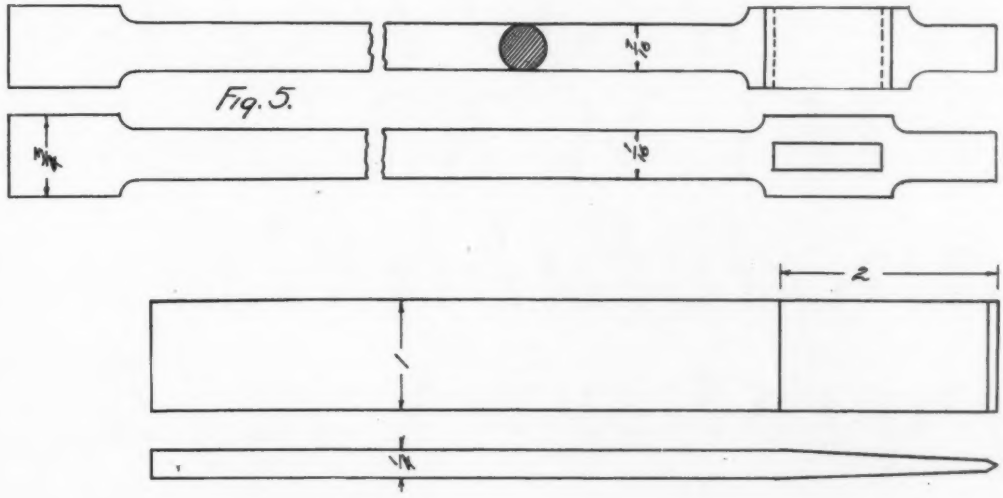
The only operation left is to drill the hole for the center tine and file ¼"x1" hole true. The bar can now be ground and finished to size ready for the tines.

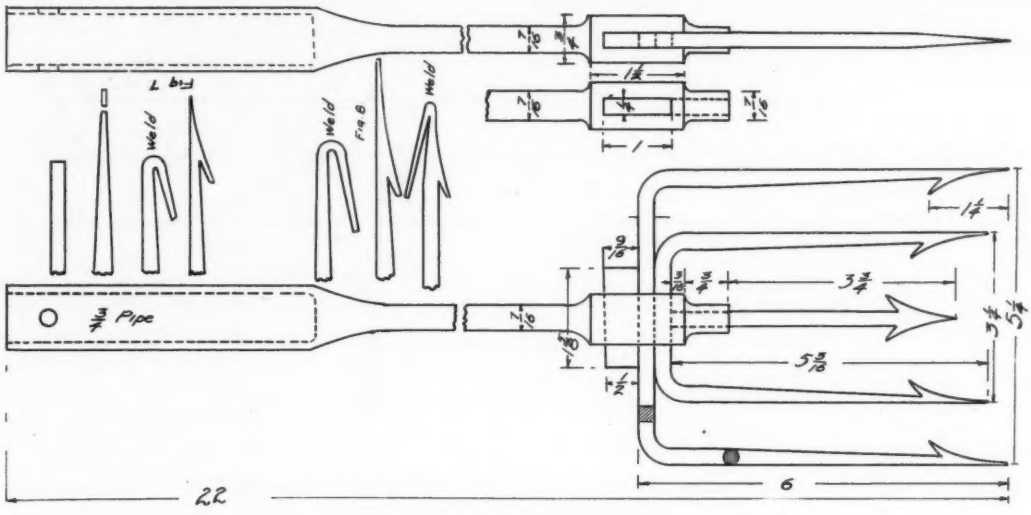


DEVELOPMENT FOR FORGING A FISH SPEAR.

For the tines, it is necessary to use ¼" square spring steel. This should be cut to the proper length, allowing for each tine to draw ½". Then mark the center and the two bends, after which the tines should be drawn to the taper shown. The binding should now be done and after the tine tips have been cut to proper length, which is ¼" longer than the drawing shows, the said point should be flattened as shown in Fig. 7. Now bend the tip back as shown in this figure which is to be welded, forming the barb for the tine. The welding should be done with welding compound at a cherry red heat, or slightly higher. After welding, the tine is forged to shape and filed to a finish. The barb should take the appearance of your little finger nail. The concaved part is on the inside next to the tine. Should you have trouble with the weld, it may be brazed with spelter to make the job more secure.

The barbs shown in the drawing are plenty large, but it is difficult to represent them smaller. The barbs do not have to be very large and I would suggest filing them down to some extent. The writer has seen spears used with several barbs cut on a tine with a cold chisel, and the spears were successful. Too large barbs are too difficult to remove from the fish without doing too much damage to your prize.





DETAILS OF THE FISH SPEAR.

The other tines are finished the same way after which the entire tine may be filed and polished. The center tine is forged from ¼" round spring steel. The double barb is made the same as the single one, except that it is folded twice and welded each time in place of once. The tine should also be tapered a little but not to the extent of the outside ones. This center tine should now be placed in position and brazed.

The other two sets of tines should now be placed into position, the wedge made and driven into place. It is often customary to braze the wedge and tines together, to insure them not becoming loosened in service. Should a tine be broken, it can easily be removed by heating to a red heat, driving out the wedge and removing the tines while yet red.

It is not necessary to temper the tips as some suggest, for the steel is firm enough to return to its proper position when sprung out of shape. There is also a great danger of breaking a tine and care should be used not to cool the spring steel in water at any time. A hole should also be drilled in the shank so that the spear may be fastened to the handle by the use of a screw. Success to the successful fishermen.

A USEFUL ALPHABET BY W. BEN HUNT AND ED HUNT.

PROBLEMS & PROJECTS

This department aims to present a wide variety of class and shop projects in the Industrial Arts. Successful problems are invited and will be paid for. A brief description of constructed problems, not exceeding 250 words in length, should be accompanied by a good working drawing. The originals of the problems in drawing and design should be sent.

Problems in benchwork, machine shop practice, turning, pattern-making, sewing, millinery, forging, cooking, jewelry, bookbinding, basketry, pottery, leather work, cement work, foundry work, and other lines of industrial-arts work are desired for consideration.

A KITCHEN CABINET

C. A. Braemer, Black Creek, Wisconsin

(For Drawing See Supplement)

The homemade cabinet, illustrated in the accompanying drawing and photograph, has been constructed in response to a demand of a subscriber of the INDUSTRIAL ARTS MAGAZINE for a practical cabinet. It is 6 feet, 3 inches high to the top of the closet, and 31 inches high to the top of the table; the width is 22 inches.

The space below the cabinet contains the flour bin, a large drawer, a rack, and the dough or pastry board. The bin is fastened to the frame with loose-pin hinges, which allow it to be removed, cleaned and replaced. It may be lined with tin to make it moisture, insect, and mouseproof.

The dough board should be made of an odorless wood, and carefully fitted into the opening below the table. A batten must be tongued and grooved on each end of the board to prevent warping.

The roomy drawer is used for small utensils, while the space below may be occupied by the kitchen stool, or fireless cooker, when not in use. Pie tins, lids, and covers find a convenient place in the rack below the drawer.

A drop table 21 or 22 inches wide and 19 inches long, at the left, increases the table surface. The table is to be supported by means of an inexpensive folding bracket.

The upper part of the cabinet provides a closed compartment, consisting of three drawers, three shelves, a knife rack, and a row of hooks for hanging utensils. The closed compartment is for package goods and large utensils; the drawers are for kitchen linen and similar articles.

There is a lower shelf 5 inches deep and upper shelves 7½ inches deep, on which may be placed coffee, tea, and sugar cans, and spice jars. Below the lower shelf there is a strip 1½ inches wide, which holds the screw hooks. The knife rack is made of sawed slashes one inch deep in a piece of material two inches wide.

The cabinet may be finished with two coats of white paint, followed by one coat of white enamel. Metal or wooden handles may be used on all doors.

Bill of Material for Kitchen Cabinet

4 pieces 1¾″x26½″. Legs.
4 pieces ¾″x2″x2′ 5½″. Around flour bin.
4 pieces ¾″x2″x1′ 4″. Around flour bin.
1 panel, two or three-ply, ⅛″x1′ 5″x2′. Back of flour bin.
2 panels, two or three-ply, ¼″x1′ 6½″x2′ 9¼″.
1 piece ¾″x9″x1′ 5½″ } Around table to hold the legs.
1 piece ¾″x9″x2′ 2¾″ }
2 pieces ¾″x1′ 9″x2′ 6″. Below and above large drawer.
1 piece ¾″x19″x22″ for drop table.
2 pieces ¾″x22″x4′ 1½″. Table plate and top board of cabinet.
1 piece ¾″x5 ″x2′ 3½″. } Shelves in open compartment.
2 pieces ¾″x7½″x2′ 3½″. }
1 piece ¾″x 7½″x3′ 7″. } Side board of open compartment.
1 piece ¾″x12½″x1′ 3½″. }
2 panels ¼″x12¾″x3′ 5¾″. Back of open compartment.
3 pieces ¾″x2″x3′ 7″. } Around the panels of open compartment.
2 pieces ¾″x2″x2′ 1¼″. }
4 pcs. ¾″x2″x3′ 7″ } Around the closed compartment.
4 pcs. ¾″x2″x1′ 1¼″ }
2 panels ¼″x1′ 2¼″x3′ 4″ }

1 pc. ¾″x7¾″x1′ 4″ } Amount needed for one drawer in closed compartment.
2 pcs. ½″x7¾″x2′ 7″ }
1 pc. ½″x7¾″x1′ 4″ }
1 pc. ½″x1′ 4″x2′ 7″
3 pcs. ¾″x2″x1′ 4″. Between drawers.
6 pcs. ¾″x2″x1′ 7″. Between drawers to run on.
2 pcs. ¾″x2″x1′ 1¾″ } Door in closed compartment.
2 pcs. ¾″x2″x12″ }
1 panel, ¼″x13″x1′ 2½″ }
1 pc. ¾″x3″x1′ 7″. For flour bin rest.
1 pc. ⅜″x1½″x2′ 3½″. Rail for screw hooks.
1 pc. ¾″x2″x1′ 6″. Knife rack.
2 pcs. ¾″x3″x10″ } Rack below large drawer.
2 pcs. ½″x1½″x1′ 8″ }
1 pc. ½″x3″x1′ 6½″ }

Flour Bin

2 pcs. ¾″x2″x2′ ¼″ } All basswood or other odorless wood.
2 pcs. ¾″x2″x12″ }
1 Pc. ½″x13″x1′ 9¼″ }
2 pcs. ¾″x1′ 5″x2′ }
1 pc. ¾″x12″x1′ 2½″ }
1 pc. ¾″x1′ 2½″x1′ 6″ }
1 pc. ¾″x1′ 8″x2′ 2¾″ } Pastry board with end cleats grooved and tongued and glued.

Large Drawer

1 pc. ¾″x6″x2′ 2¾″.
2 pcs. ¾″x6″x1′ 7″.
1 pc. ¾″x6″x2′ 2¾″.
1 pc. ¾″x1′ 7″x2′ 2¾″.

Hardware

1 cupboard catch.
1 pr. butterfly hinges or butts.
1 pr. 2″ butts for flour bin, butts with loose pin.
Seven or more screw hooks.
Six draw pulls.
Two brackets for drop table.
1 pr. table hinges for drop table.

N. B.—This bill of material does not make allowance for waste. The drawing is based on ¾″ lumber dressed. Allowance must be made for any difference in the dimensions of the lumber.

A PARING KNIFE

J. G. Childs, Sheboygan, Wis.

(For Drawing See Supplement.)

Three things are necessary to a good school shop project. It should be of practical use when finished; it should appeal to the interest of the pupil, and it should provide the means of teaching one or more shop processes. The paring knife shown here fulfills these requirements. Proof of its practical value is seen in the number disposed of among pupils and in use in the various school shops. Evidence of the interest of pupils is seen in the fact that practically every boy is proud of his handwork, pays for it, and takes it home. The shop processes taught will be taken up by operations as outlined in the accompanying drawing.

The first operation is to teach a method of cutting up hardened stock; viz., by nicking and breaking. Because the grinding is done on the corners of the wheel, the pupil realizes the necessity for keeping the corners sharp by grinding on the face of the wheel, except when the corners are actually needed. He learns that the wheel must run true, the work rest must be set close, and that he should protect his eyes with goggles.

The second operation teaches a method of laying out on surfaces too hard to take a scratch mark. Copper from the solution is deposited only on the clean metal surface; finger marks must be ground off or the copper does not take. The pattern must be held securely to prevent shifting and to get a layout the same as the pattern. The line scratched in copper does not rub out.

The third operation is to teach control of work at the grinding wheel in following the outline, and further emphasizes the necessity for a true wheel, straight face and sharp corners. Sharpening requires particular care in keeping the angle of the bevels the same from point to heel and on both sides.

The fourth operation teaches the preparation and control of fire, forge, blow torch or gas; the proper heating and tinning to the soldering bit; the application of solder to the desired surface; the purpose of acid, paste and fluxes; and the proper handling of tools, acids, and other equipment to avoid burns or fire.

The fifth operation teaches the use of the lathe chuck; drilling in the lathe; setting the tool and turning bevels; proper speeds for drilling and turning and the methods of changing speeds. The cross-hole is laid out and drilled at the drill press. The care necessary to protect work, tools and person are taken up here in the first operation requiring the use of machinery. The handles are of hard

wood scraps and are prepared in the wood shop. These are best made in quantity, as the work of setting up and cleaning the lathe is greater than the making of one handle would warrant.

The sixth operation teaches the preparation for, and the pouring of babbitt or soft metal. The corners were broken to permit the paper to hug the work closely. The work is held in the vise so it will be held rigidly in a convenient position, and that the jaws may help in preventing leakage at the cross holes. The proper heat for the pouring of the babbitt, precautions to be taken to avoid burns, the danger of explosions due to moisture trapped in recesses and the necessity for wearing goggles are taught in this lesson.

In the seventh operation the pupil is taught to properly chuck his work; to support the outer end of the work to withstand the pressure of the cut and one or more methods of turning a taper.

The eighth operation is to teach control in the use of hand tools in bringing the handle to the desired size and form. The pupil is particularly cautioned not to grind the handle as the wood and babbitt will load the emery wheel. The handle is soaked in raw oil to fill the pores in the wood and prevent swelling from the absorption of water when in use. A sufficient polish may be given the blade by hand rubbing with emery cloth.

This method of presenting the project by operations gives the pupil a general idea of what is ahead of him. Each operation is a lesson, these are taken up in detail as class lectures and the purposes, processes, safety, and other particulars are explained. The notes accompanying the drawing are not intended as complete instructions; they serve to remind the pupil of the sequence of the operations.

This project had been used satisfactorily for ten years both as an individual and a class problem. The cost is practically nothing, as all material, except solder and babbitt, is waste. This makes a substantial and serviceable knife; it is light in weight, the blade holds its edge, and the handle cannot come loose. Knives of any size and description may be made in this manner. In a sawmill country any amount of good blade material for kitchen or hunting knives is available.

BOOK AND LETTER RACK

A. C. Traudt, Sioux City, Ia.

(See Supplement.)

It is sometimes quite hard to find projects that are practical and interesting to a junior high school boy. One that I have found to be rather interesting and practical is a combination bookrack and letter holder. In this bookrack we have a long drawer which may be used for stationery. Some of the boys in my class have made the rack a few inches longer and are using it for a stand on which they place their radio, and the drawer they use for radio magazines.

This bookrack is made of one-half inch material, and of most any kind of wood, as mahogany, walnut, oak, or gum. It involves the use of a number of tools such as saw, plane, brace and bit, screw driver, trysquare, and hammer. In making this project the boy learns how to square up a board, to make a butt joint, to drill holes for screws, and to design the ends.

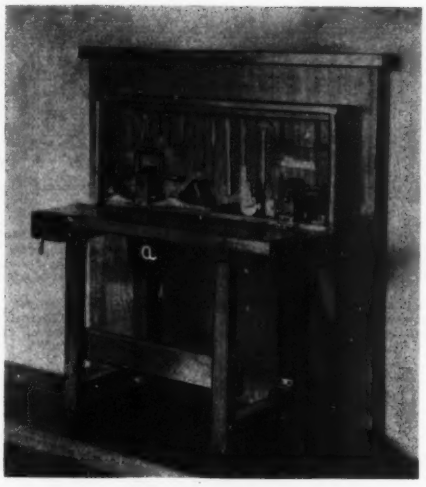
A TUCKAWAY BENCH

Chas. A. King

(See Supplement.)

The most insistent motive prompting the designing of this bench was the desire to meet the urgent need for such an article of equipment in rural schools and wherever the crowded condition of schoolrooms precluded the possibility of using the ordinary type of bench. Later it was suggested that the bench would quite as well meet the needs of dwellers in cottages and bungalows whose restricted quarters compel them to forego the pleasures of making things, and this motive became an additional factor in making the model.

The first need of a bench of this sort is that it shall effectively meet the requirements of a work bench; the



THE BENCH READY FOR USE.

second, that it may be easily folded into the smallest space possible; the third, that the tools may be covered or securely locked by the same motions which fold the bench into its place as a door of the tool case; and fourth, that the device may be manufactured at the lowest price possible.

By dropping the bolt "a", indicated in the photographs, the bench top will instantly fall into correct position for use as a work bench. The same motion brings the tools ready at hand for use. In this position the bench top projects about 24" from the wall against which it is fastened, exclusive of the vise. Its length is 48" and is ample for almost any work the student or the home worker will be likely to attempt. After the period of work is ended, the tools may be put in their places, the bench brushed off and lifted into its place, and the bolt "a" slipped into its socket. If preferred, a padlock or other lock may be fitted instead of the bolt "a". In this position the bench will project about eight inches from the wall.

THE BENCH FOLDED UP.

There is an abundance of room in the tool closet for all the tools necessary for ordinary hand work in the home or school. As the photograph was taken from a quarter size model, the difficulty of securing model tools of that scale prevented the placing of as many tools in the cabinet as it might easily accommodate.

After the material had been cut to dimensions, rabbet the under side of the top and the inside back corners of the back edge of each end as at "u", to receive the back.

Stock List of the Tuckaway Bench

1	Top b	1¾" x11" x48"
1	Top c	⅞" x12" x48"
2	Front Legs d	1¾" x 2¾" x28½"
2	Back Legs e	1¾" x 2¾" x39"
2	Ledges f	1¾" x 2¾" x22¾"
2	Ledges g	1¾" x 2¾" x20¼"
1	Front brace h	⅞" x 5" x36"
2	Case Ends k	⅞" x 4⅝" x29"
1	Top l	⅞" x 5⅝" x52"
1	Top m	⅞" x 1½" x41"
1	Bottom n	⅞" x 3" x28¾"
2	Bottoms o	⅞" x 3" x 7⅝"
1	Back p	½" x23½" x48⅝"
2	Stops q	½" x 1½" x 6"
2	Back Fillers r	1¼" x 2¾" x 8"
2	Back Fillers s	1¾" x 2¾" x 6"
2	Furrings t	⅞" x 2¾" x 8"
4	pairs of heavy hinges 2½" wide with 1½" screws, large wire.	
1	Rapid action vise, face 7" long.	

Cut grooves in the case ends, and in each side of the back legs as at "v", to receive the ends of bottoms "n" and "o".

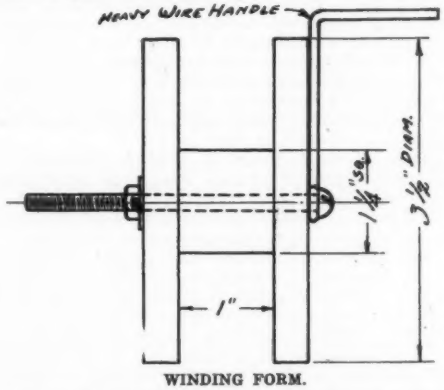
In setting the bench up, the case must be fastened to the wall with screws at "w", at just the right height to allow the bottoms "o" to fit into the grooves "v" of the back posts, or legs. The middle section of the bottom may be fastened in place in the grooves "v", and the bench pushed back into place and fastened to the wall by lag screws, or by large flat-head screws if preferred, so placed that they will enter the studding, which will usually be about 32" to centers as indicated, and hold the bench strongly. The bench and case may be stained or varnished as desired.

A "WIRECORE" TRANSFORMER

Lee M. Klinefelter, Ruffner Junior High School, Norfolk, Va.

This little transformer was designed with the idea of making, with a minimum of tools and equipment, a transformer suitable for bell-ringing service. In order to do this, the usual sheet iron core has been replaced by a core of iron wire, since a sheet iron core is usually a rather difficult proposition, unless there is a squaring shear at hand.

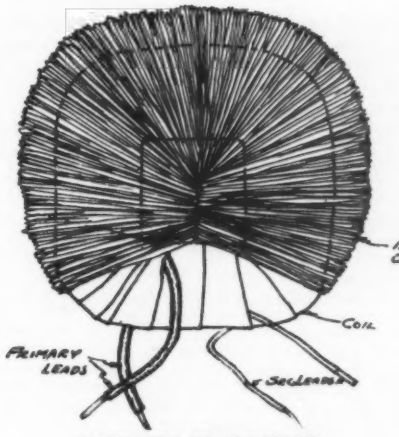
A bell-ringing transformer should be designed so as to use as little power as possible on no load, as it is usually connected continuously across the line. The amount of power consumed by this transformer is so small that it will not move an ordinary service watt-hour meter at all. This is due to the liberal size of the core and the large number of primary turns.



WINDING FORM.

The form for winding the coil is shown in the drawing. As shown, it has a square core and round endplates. Both could be made either round or square, but it is easier to make the core square, unless there is a lathe at hand; the round ends make winding easier, since there are no corners to catch the wire. It is well to line the form with cardboard or heavy paper before winding, and this can be left on to serve as insulation and to hold the coil together when it is removed from the form to be taped.

The primary winding consists of about 2000 turns of enameled or double cotton covered wire, about No. 34, for 110 volt service. The exact size of wire is not important, and any material at hand near the size mentioned may be used. A piece of lamp cord two feet long should



COMPLETED TRANSFORMER.

be soldered to the end of the wire and used as a lead-in. It should be brought in through a hole in the end of the form and enough left inside the form for one or two turns around the core to keep any strain on the lead-in from breaking the fine wire. The primary is random wound, though an effort should be made to keep the winding level as it fills up. A hole drilled in the edge of a board will take the projecting end of the through bolt and make it easy to spin the form by means of the wire handle. After the 2000 turns have been wound on, another piece of lamp cord should be soldered on, given a turn or two around the coil, and the end brought out near the starting end.

Several turns of friction tape, or heavy paper, should now be wrapped around the coil, and the secondary winding of 100 turns of approximately No. 20 double cotton-covered wire put on. This should be layer wound on account of the size of the wire. After the secondary is in place, the coil should be taken from the form and well taped. Friction or muslin tape can be used or strips of cloth folded so that each turn covers the ragged edge of the preceding turn.

The wire core is the last step. For this use ordinary soft iron stovepipe wire, or in fact any soft iron wire. It should be cut in lengths a few feet long for convenient handling, and threaded through and around the coil, until the center is packed full. The sketch of the completed transformer shows the core in place. It will be noticed that the leads are all brought out of one side of the coil and that the core is not wound around this side.

AN EXPERIMENT IN TABLE TOPS

H. A. Hunter, Kelseyville, Calif.

The use of battleship or hard linoleum for table and desk tops is not a new idea—but how many of you shop men ever tried using ordinary solid color floor linoleum for the same purpose? I have and have found it to be a decided success, easy to do, economical, durable and exceedingly artistic and pleasing to the eye.

In constructing four 8'x34" commercial tables this summer I made the tops of ordinary well-seasoned pine boards 12'x12"x1½", surfaced on four sides. I fitted the edges together carefully and of course made my tops perfectly level, fastening same down carefully with flat headed screws lightly countersunk. Then using non-waterproof linoleum paste I pasted on a layer of deadening felt and rolled same thoroughly with a linoleum roller. By next day the edges of the felt were carefully trued up to the edges of the table by means of a rasp and sandpaper. Then I glued on the linoleum in the same manner, allowing a slight overlapping all around, and

FIG. 1.

carefully rolled out all bellies. The following day I trued the edges down to that of the table with a plane so my job looked like (Fig. 1).

The work is now ready for the border. In my case I mitered some strips of fir which were 2 inches wide ½ inch thick. I glued these to the edges of the table and reinforced with finishing nails—leaving the same clamped until the glue was set. The work looked like this at this point.

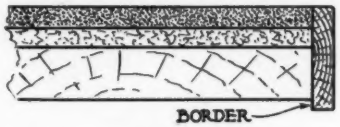


FIG. 2.

Finally I finished the border with plane, sandpaper, and putty, gave it the stain I desired, and gave the top two coats of Valspar varnish.

The things to look out for are:

1. Use thoroughly seasoned wood for the top.
2. Roll out all bellies in the linoleum and felt.
3. Both glue and nail or screw the border.
4. Let the paste dry thoroughly and be careful not to loosen the edges in rasping off feet or planing the edge of the linoleum.
5. Use a good grade of linoleum—the blue-green solid color that looks about like hyloplate is excellent and restful to the eyes.
6. Do not put any nails or metal through the top.
7. Varnish the top to prevent ink being absorbed.

ERRORS IN HAND WORK—II

Chas. A. King, State Normal School, Plymouth, N. H.

(See Page 26)

This is the second of the series of photographs illustrating common errors in the use of common woodworking tools. The following key will explain the pictures:

Use of the Chisel (Fig. 5)

Errors in Position. (1) The right arm should be close to the right side of the body. (2) The back should be bent so that the shoulders will be over the work.

Errors in the Use of the Tool. (1)The right hand should grasp the chisel with the thumb and forefinger at the top of the handle. (2) The back or beveled side of the chisel should not be used in trimming to a knife line.

The Use of Edged Tools (Fig. 6)

Error in position—work of the type indicated in the illustration should not be held in the left hand when a vise is available.

Error in Tool Use. A piece of wood should never be held in one hand in such a manner that an edged tool will cut toward it.

The Use of the Chisel (Fig. 7)

Key—both the body position and the use of the tool in this illustration are essentially correct.

The Use of a Chisel in Mortising (Fig. 8)

Types of Tools Used. (1) A mallet should be used on a wood handle instead of a hammer. (2) The head vise of a bench should be used for such work instead of the tail vise.

Errors in the Use of Tools. (1) The end cuts of a mortise should be finished with the straight or face side of a chisel instead of the back or beveled side. (2) Usually the left hand grasps the chisel near the end to place it accurately and remains there while the cut is being made, especially upon small work. (3) The right hand should grasp the handle of the hammer or mallet near the end instead of close to the head.

VOCATIONAL EDUCATION SOCIETY OF BOSTON

An innovation in the matter of program marked the regular monthly luncheon meeting of the Vocational Education Society of Boston, which was held Saturday, November 14, at Cook's Restaurant, Boyleston Street. At this meeting, the first under the presidency of Mr. Robert Baker, there were three speakers instead of the customary one, although the regular length of time was not exceeded.

Dr. John W. Brewer of the Harvard School of Education spoke briefly upon the importance of cooperation in present-day life—an importance which not only extends over the civic, social and industrial fields, but welds them into one. Vocational educators in particular, he urged, should realize that their task is very imperfectly fulfilled in merely teaching to their pupils self-expression in lines of skilled craftsmanship. The paramount phase of the vocational objective should be coordination of the individual with others as units in a common harmonious system.

Professor Brewer illustrated his point with the statement that he had recently watched ninety workers performing a job so intricate and so delicate as to demand complete unity of effort, and such perfect synchronization that a difference of one-fifth of a second in any worker's part would have a noticeably adverse effect upon the work. The illustration became less startling, but no less impressive, when he explained that the organization to which he referred was the Boston Symphony Orchestra.

The perfect harmony of an orchestra, said Dr. Brewer, is after all not a very great exaggeration of the cooperation already essential in society and in industry, with the tendency strongly towards more rather than less. "Vocational life is already incorrigibly cooperative," he declared.

Dr. Brewer mentioned a matter of timely interest to all Massachusetts citizens—the recent report of a committee of the Massachusetts Superintendents' Association upon the school age requirement. This report advocated, instead of an arbitrary change in the compulsory school age, a raising of the educational requirement to eighth grade graduation. It suggested however such a re-casting of school facilities and programs as would permit the fulfillment of this requirement by minors of working age on a basis of half time in school and half time at work. A bill embodying these recommendations will undoubtedly be presented to the legislature in January and, if passed, will result in a drastic change in the Continuation School organization.

Professor Herbert Blair of Boston University outlined the plan approved by the Executive Committee of the School of Education for giving degree credits for skills acquired in industry. Many members of the Society are at present pursuing courses at Boston University and other institutions. The Boston School Committee, too, has recently made it possible for industrial teachers who possess degrees to attain the rating of High School Masters in the Boston school system.

Mr. Blair outlined the data which guided the Committee in its perfection of a plan. All technical institutions of collegiate grade give credit towards degrees for manual and mechanical subjects pursued as courses in their own curricula. Investigation showed that such courses, however, are not permitted to supply more than one year's total credit towards a degree. A similar rule prevails in liberal arts colleges. A single subject—mathematics, for instance—can be the basis of not more than one-fourth of all the credits towards a degree. This plan is designed to prevent the possibility of a student"s "majoring" so exclusively in any one branch of learning as to defeat the broad educational purpose of the institution.

The executive committee of the School of Education, guided by these facts, voted to give a maximum credit of thirty semester hours for industrial skill and knowledge, however and wherever it may have been gained. This is merely accrediting a man for his possession of the subject-matter which he teaches; just as the School of Education would accredit a teacher of Latin for his knowledge of

A PRIZE CONTEST IN SHOP PROJECTS

The INDUSTRIAL-ARTS MAGAZINE is interested to receive and publish a number of projects which (a) illustrate scientific principles of educational value, and which (b) can be utilized in the science classes in elementary and high schools. To stimulate interest, prizes for the best projects will be awarded as follows:

1. The projects should illustrate some useful scientific or mechanical principles, or be of use in demonstrating such principles in the school laboratory or lecture room. They should be well within the ability of seventh, eighth, and ninth grade pupils to construct in the woodworking, electrical, sheet metal, or other shop.
2. The drawings or tracings should be inked in and should not exceed 10" x 15" in size. Blue prints cannot be considered.
3. A description of the project, not exceeding 600 words in length, with the name and complete address of the author, should accompany the drawing.
4. Drawings must reach the office of the INDUSTRIAL-ARTS MAGAZINE not later than March 1, 1926. Originals will be returned only if accompanied with stamps and a definite request for return.
5. A jury consisting of an Editor of the INDUSTRIAL-ARTS MAGAZINE and a competent instructor will pass on the projects so that the announcement of the winners can be made in the May issue of the MAGAZINE.
6. For the best problem submitted a prize of $15.00 will be paid, and for each of the three projects next in merit a check for $5.00 will be sent. Projects acceptable for publication will be paid for at space rates.

that subject, whether it had been acquired in the college or through private study. These thirty points, however, constitute a maximum. Industrial abilities gained in technical institutions or normal schools of manual training can not be added to actual trade experience to make a total of more than one year's accreditable work.

Certain other restrictions aid in insuring that the bachelor's degree in education will not be cheapened under this liberal arrangement. Thirty of the total credits towards the baccalaureate degree must be gained in residence at the college. This residence need not be continuous, however; and the requirement may be met through attendance at summer sessions. Certain subjects generally agreed upon as prerequisites to a liberal degree, such as English and science, must be properly represented among the credits. The university authorities stand ready to work out individual programs to fit the needs of individual candidates.

Professor Blair's announcement elicited great interest among the members of the Society, and he was the target for many questions.

Mr. Edward C. Emerson, associate director of manual arts of the Boston School Department, was the third speaker of the afternoon. Mr. Emerson spent last summer in a motor tour of Great Britain, and gave a very interesting account of his experiences.

The description of his itinerary sounded very familiar to New England ears, including as it did such places as Worcester, Shrewsbury, Gloucester, Melrose, Boston, and Cambridge. These British namesakes bear little other resemblance to our Massachusetts cities, however. Historic and literary shrines seem to abound everywhere, said Mr. Emerson. Thatched cottages, framed of roughhewn timbers, present quaintly curved lines which have no counterpart in American architecture. The narrow and winding streets of English towns, however, seem not quite so foreign to a Bostonian.

Speaking of the churches and cathedrals which are so important a part of England's heritage, Mr. Emerson dwelt upon the loving craftsmanship of the men who so painstakingly built them. He cited the Cathedral of Winchester, whose main portion, with the hand labor which alone was available, was completed in a space of five years. He spoke of the wonderful stone carvings which were planned and executed by innumerable nameless men working for wages which meant a bare subsistence—but working for more than mere wages. Work which is even now being done in the restoration of some of these buildings convinced Mr. Emerson that the spirit of craftsmanship is not dead, and is not anachronistic in modern life. It is this spirit, he said. which teachers of manual and vocational subjects should endeavor to cultivate and direct in their pupils.—**Frederick Ames Coates.**

THE SCHOOL CRAFTS CLUB INSTALLS NEW OFFICERS

The officers for another year were installed at a meeting of the School Crafts Club held in Geneva Restaurant, 143 West 44th St., New York City, on Saturday evening, November 21, 1925, as follows:

President, Charles H. Kennington, Newark, N. J.
Vice-President, Thomas Darling, New York City.
Treasurer, Russell F. Hemion, Paterson, N. J.
Secretary, Arthur F. Hopper, 24 Randolph Road, Plainfield, N. J.
Financial Secretary, Lloyd F. Stair, Madison, N. J.
Program Committee, Julius Eisenstein, Thomas Lawson, Frank Baker, Samuel Tanenbaum, John Dockstader, Arthur T. Gardner.
Publicity Committee, Lloyd F. Stair, L. O. Asher, John F. Gettinger, John Honan, Albert Petterson.
Membership Committee, David Petrie, Robert A. Campbell, H. L. Fletcher, R. W. Van Houten, Julius Singer.
Entertainment Committee, John Mulholland, O. S. Kinsman, Otto Schantz, P. L. Schneider, G. W. Renneman.

Speaking upon the subject "The Junior High School and the Industrial Arts Subjects," Mr. Robert Brodie gave his hearers the reactions of an administrator to the development of industrial arts. Mr. Brodie is the principal of a large junior-senior high school in New York City. Industrial arts is a broad subject, with such factors as subject matter, methods, progress, and prognosis as to the future to consider. Mr. Brodie told of a young minister, who after listening to a sermon by Henry Ward Beecher, asked Mr. Beecher how it was that he could orate interestingly for so long whereas he himself was at a loss for words. The great preacher said, "That is easy young man, simply tell them your experiences." So Mr. Brodie concluded that his best approach to the subject would be through his experiences as a principal.

Schools under Mr. Brodie's direction have passed through the stages of paper-cutting and drawing, sloyd, whittling, and finally manual training. On its introduction manual training had no standing, but was a special subject with teachers untrained in pedagogy and with a narrow type of work. However it later achieved a sounder footing by means of better trained instructors and diversified courses of study. Mr. Brodie's school now has eleven shops for boys and six for girls.

From the start the teaching force was a problem. The men were direct from the trades—earnest, thorough, and hardworking, but ignorant of teaching methods. Principals had a hard task making teachers of them for they lacked knowledge as to discipline, and group and class teaching. Some have left teaching, but many stuck it out. Those who looked upon teaching as a profession, and not merely another job, have stayed. At the present time the average of manual training teachers has shown progress in methods and discipline.

Shop subjects must cover more than technical processes. In the subject of printing a great deal of information can be incorporated other than mere practice in

CHAS. H. KENNINGTON,
Newark, N. J.

type-setting, etc. Arithmetic, language, geography, and history may be correlated. Mr. Brodie found that it was not efficacious for the teacher of arithmetic to teach the mathematics which applied to printing, because of a lack of interest and knowledge of printing. The same proved true in regard to the other correlations. According to another plan, the industrial-arts teacher was held responsible for the correlations and devoted a portion of the shop time to them. The results were good. The latter plan does two things which are desirable. It centralizes the responsibility and it elevates the shop man to a teacher of academic work, thus placing him on a par with other teachers. But he must learn the art of teaching; he must teach and not just talk. He must use questions and answers to stimulate thought on the part of pupils. Mr. Brodie has pushed his teachers, almost to the point of coercion, to show signs of growing. He urges them on to self improvement by means of reading, study, preparing for examinations, taking and passing examinations, and taking new and higher positions. It is up to the industrial-arts teachers themselves to improve the standing of their subject by advancing to positions which have weight and influence. The average principal does not have the right point of view in regard to this subject.

In conclusion, if the industrial-arts work is to advance it will be through (1) Incorporation of correlated academic subject matter, and learning how to teach it; (2) Advancement personally to positions of influence by men familiar with details of industrial-arts teaching.

A representative from the Capitol Machine Co., Mr. Dunn, spoke upon the moving picture as an aid to instruction in the school shop. Two years ago an experiment was conducted in the teaching of schists in connection with geology. A woman teacher made a moving picture to cover the subject matter. After a class had studied schists with this instruction, the class averaged 92 upon examination. A professor took another class through the same subject matter, using regular methods and upon examination his class averaged only 76. This

is a great difference and goes to show how helpful this added visual instruction may become. Mr. Dunn believes that children learn more readily what they see in movies or through direct observation. Using a machine such as one often sees in store windows for advertising purposes, Mr. Dunn showed films illustrating the production of Red Wing shoes, and the making of General Electric conduit and cable.

Mr. Frederick C. Arnold, retiring president of the School Crafts Club spoke upon "The Shop Teacher—His Job." Mr. Arnold fortified some of the points brought out by Mr. Brodie and then went on to give his reactions as a teacher of industrial-arts. A successful teacher must know the subject matter thoroughly. Children soon size up a man who is only slightly ahead of them in the subject. Also it takes a great amount of patience to get information over to the child. Mistakes must be promptly corrected and the teacher must see that this is done by the pupil. In presenting material to a class it is easy to ramble and wander. The subject matter should be thought over and outlined to avoid this. To keep up-to-date a teacher must study and read.

The following men were received into membership:
George C. Young, WoodRidge, N. J.
K. W. Ebeling, Brooklyn, New York City.
Michael P. Boerner, New York City.
William M. Devonald, Newark, N. J.
Richard O. Harthman, Newark, N. J.
Charles E. Benter, Newark, N. J.
Neil Flanagan, Newark, N. J.
Frank Henry, Newark, N. J.
John Barry, Jersey City, N. J.
Norman A. Crow, Paterson, N. J.

Reports were heard from Mr. Thomas Darling, retiring secretary, and Mr. Russel F. Hemion, treasurer. Mr. Darling has estimated that for two years the dinner meetings average slightly higher in attendance than regular meetings, the average for the former being 66. About 30 per cent of the membership are enjoying the benefits of attendance. The treasurer's report shows that the finances of the School Crafts Club are in satisfactory shape.

President Frederick C. Arnold appointed a committee with Mr. Philip M. Wagner as chairman to draw up resolutions to be spread on the minutes in honor of Hugo B. Froehlich, late director of industrial-arts, Newark, N. J. Mr. Froehlich was an ex-president of the School Crafts Club.—**Lloyd F. Stair.**

NOW, ARE THERE ANY QUESTIONS?

Battery Charging Outfit

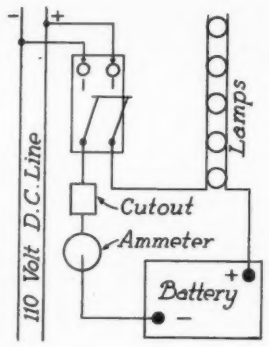
Q. 562. I desire to build a battery charging outfit for use in connection with a 110 volt, 1,500 watt, Kohler lighting plant, D. C. current.—D. B.

A: Battery charging outfits using Tungar bulbs or other forms of rectifiers will not work on direct current. They will operate on alternating current only. The usual method of charging automobile or radio batteries on a 110-volt, direct current system is by means of a lamp bank connected as shown in the sketch.

When charging from a plant that may stop while the attendant is absent, a cutout should be used to prevent the battery from discharging back into the system, should the line voltage fail. A second-hand cutout from an automobile will serve very well, using only the current coil and reclosing each time by hand. The voltage coil in these cutouts is designed for only six to twelve volts and will quickly burn out if connected across 110 volts. An ammeter is desirable, but not absolutely necessary. An old automobile ammeter will do here also.

No. 14, rubber covered wire should be used. The switch is two-pole, with slate or porcelain base, fused not to exceed ten amperes. The lamp sockets are porcelain receptacles, catalog number 50715, or similar, spaced three inches apart. Mount the switch, lamps, ammeter, and cutout on an asbestos covered board and do not enclose the lamps for they throw off much heat. Flexible wires with regular battery clips on the ends are better than solid wires to lead from the charging outfit to the battery. The use of a hydrometer to determine the condition of the battery is advisable with this, as with all other methods of charging.

If 100-watt lamps are used, each lamp will let through about one ampere; 50-watt lamps about one-half ampere each. Carbon lamps are usually used for this purpose when they can be obtained, since they are cheaper than Mazda lamps. The usual charging rate is five to eight



amperes. Any number of six-volt batteries up to 10 may be charged on 110 volts as easily and cheaply as one, but in this case more lamps will be needed to let enough current through and an ammeter is quite necessary to tell how much current is flowing. One ampere per 100-watt lamp, as above specified, will be obtained only when one battery is being charged. The lamps may be connected in either side of the line.

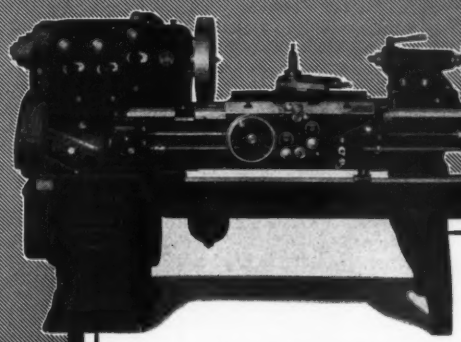
The leads to the battery should be tested for polarity. To do this, screw in one or more lamps, then dip the ends of the leads into weak salt water in a glass or porcelain dish. The lamps will light and both wires will throw off gas bubbles, but the negative will throw off more than the positive. Permanently mark the leads positive and negative, and when charging, connect the negative wire to the negative battery post. Also the positive wire to the positive post. Make no mistake here for a reversal will ruin the battery. If more than one battery is charged at once, the positive of one to the negative of the next should be connected, then the positive end of the string of batteries is connected to the positive line wire and the negative end to the negative wire, as before.—**E. W. Jones.**

Silver Gray Stain

548. Q: Will you please tell me how I can make a silver gray stain on oak? The sample which I desire to imitate is very light.—F. S.

A: Practically all grays of this type, as per sample, are produced through the use of solutions of iron salts on a tannic acid base. With this method, a solution of one-half ounce of tannic acid and one-half ounce pyrogallic acid is made by adding these materials to a gallon of warm water in a clean jug or glass, since these acids may not come in contact with iron or tin without forming ink. The carefully sanded cabinet work may be sponged with this solution and allowed to dry. Great care must be taken to avoid touching the freshly acid-treated surfaces or ink spots will immediately form. Place the hands on the work in such a manner that these spots will not show as the under parts of the table top and the seats of chairs. Allow to dry over night and sand very smooth with worn-out 00 paper.

Make up an iron solution by adding one-half ounce of copperas (ferrous sulphate) to one gallon of warm water. Apply this to a panel which has been treated with tannic acid and allowed to stand over night, after which apply a very thin coat of white shellac and alcohol. Sand with a split 6-0 paper when hard and dry. Make up a white filler, using two pounds of silex, one-half pound of zinc white in oil, and one pound of white wax or floor wax. A couple of tablespoons of this material well mixed should be enclosed in a double thickness of cheesecloth and rubbed evenly over the shellaced panel. Allow to dry fifteen minutes and then polish with either a shoe brush, woolen pad, or a piece of body Brussels carpet until the desired surface is obtained. It is only possible to judge the shade in this manner, and if too dark, the iron solution should be reduced with a measured quantity of water, and if too light, a proportionate amount of copperas should be used to strengthen the solution. The shade of color desired can only be arrived at after careful experimentation, during which all corrections to the formula should be carefully noted. It is my experience that this type of gray is not desirable in that it is too blue and cold. It is considerably affected by the amount of white filler left over the shellac coat, since the more that is removed from the surface, the deeper the shade will be. The opposite side of the sample, obtained by using a light brown water stain, covered with dilute orange shellac, sanded glass smooth and filled with the white wax composition previously mentioned, is far more pleasing, more readily lends itself to other pieces of furniture, and in the end, is more livable, since one does not tire of it because of the warmth of its highlights.—**R. G. Waring.**



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MONARCH Helical Geared Ball Bearing LATHE

as a part of their Metal Working Equipment.

The prestige of this Institute—the corner-stone of Massachusetts' enviable system of vocational education — attracts students from the four corners of the civilized world.

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We are proud of the selection of the MONARCH Engine Lathe as a part of the Institution's metal working equipment — proud that it has been selected solely upon its merit, after careful consideration, as the type of equipment necessary for the high degree of training which Massachusetts "Tech" gives to its students—a training which has been so creditably reflected on the Institution by its graduates.

We shall be glad to plan your vocational metal working shop. Give us a statement of your requirements and let our Free Engineering Advisory Service plan your shop, giving you an accurate estimate of the entire equipment cost. This service is gladly rendered without charge.

THE MONARCH MACHINE TOOL COMPANY, 404 OAK STREET, SIDNEY, OHIO.

Good Schools Deserve "Yankee" Tools

An awkward job made easy by a "Yankee" Ratchet Tap Wrench.

Awkward jobs are found everywhere—around school shops the same as any place else.

No tapping job is impossible with this ingenious tool. Wherever you can drill a hole, the "Yankee" Tap Wrench will follow through with a clean threading job.

In tight corners, or close up to other parts, in narrow brackets, the "Yankee" Ratchet enables you to tap with perfect ease.

Right-hand Ratchet, Left-hand Ratchet, and Rigid adjustments, changed by touch on ratchet shifter. Same ratchet mechanism as used in other "Yankee" Tools.

Cross-bar can be held central or used at either end (as shown in illustration). Knurled finger turn at top starts or backs out taps.

No. 250—Length 3¼ in. Chuck diam., ¾ in. Holds up to ⅜ in. taps.

No. 251—Length 5 in. Chuck diam. ⅞ in. Holds up to ⅜ in.

No. 1251—Length 13 in. For jobs needing long reach. Otherwise same as No. 251.

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Plain Screw-drivers
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Vises, Removable Base

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"YANKEE" TOOLS

Make Better Mechanics

NEWS AND NOTES

Add New Courses. At Bellevue, O., mechanical drawing and automobile mechanics have been added to the work offered in the woodwork department. In the home economics department, costume design has been added to the course in sewing.

Industrial Arts Association of Pittsburgh Meets. The Industrial Arts Association of Pittsburgh and vicinity reorganized at its fall meeting held October 24th at the Schenley high school, Pittsburgh. The association is made up of most of the industrial teachers of Pittsburgh and vicinity, and numbers among its members about eighteen teachers of printing, as well as teachers in other lines of vocational education work. At the meetings, questions relating to the daily work are taken up and discussed. It is organized to help the men become better teachers, and its meetings afford an opportunity for the members to learn to know one another and to have a social time.

At the recent meeting, addresses were made by Messrs. Rossier and Zeil relative to part-time education in the Ralston Industrial School, the plan being to allow the boy to spend two weeks in industry and two weeks in school alternately. Mr. C. E. Carter was elected president; Mr. Brown vice-president, and E. G. Wolfe, secretary-treasurer.

Announce Poster Contest. The Eastern Art Association has announced its annual poster contest for 1926. The object is to obtain a poster to emphasize the Association's convention, and to be representative of an arts association whose membership comprises those interested in the fine and industrial arts, home economics, and vocational subjects. All students working under the direction of a member of the Association are eligible to take part in the contest. All drawings submitted by contestants must be in the possession of the secretary, Mr. F. E. Mathewson, on or before January 15, 1926.

North Dakota Association Holds Meeting. The Manual Training Section of the North Dakota Educational Association held its annual meeting at Minot. The sessions were given over to addresses and discussions relative to a course of study for the state. Mr. J. E. Bjorlie, state high school inspector, talked on the need of a revised course of study, and Mr. Lindeman, director of mechanic arts of the State Normal and Industrial School, spoke on the new aims of manual training and emphasized the fact that the state course of study needed revision. This was followed by a paper on "Home Mechanics," by Mr. F. L. Bouda, of the Minot public schools. A committee was appointed consisting of Chairman Carl V. Lindeman, director of mechanic arts, state normal and industrial school, Ellendale; Mr. D. C. Blide, director of manual arts of the State Teachers' College, Minot, and Mr. F. L. Bouda, of the Minot public schools. The committee with the consent of Supt. White, chairman of the state curriculum committee, will rewrite the course of study in manual arts for the state. It is planned to hold the 1926 meeting at Fargo.

Officers elected for the ensuing year are: President, Carl V. Lindeman, State Normal and Industrial School, Ellendale; Vice-President, Mr. F. L. Bouda, Minot City; Secretary, Mr. O. J. Lilley, Westhope.

Minima Objectives and Attainments in Art Instruction. A plan for minima objectives and attainments in art instruction for grades and high schools in the state of Wisconsin has recently been submitted by a committee appointed by the fine arts section of the Wisconsin State Teachers' Association. The outline is divided into (1) Representation, (2) Design, (3) Construction, and (4) Appreciation of the fine arts.

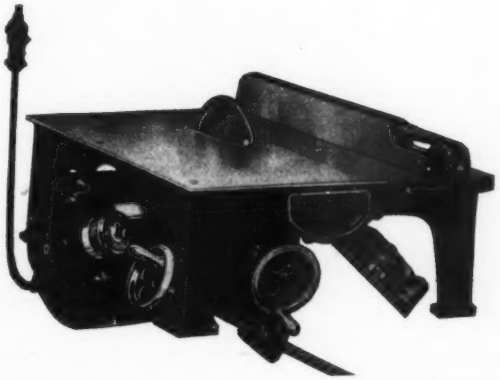
The material goes into detail, taking up consecutively objectives and attainments for representation, objectives and attainments for design, objectives and attainments for construction, and objectives and attainments for appreciation of the arts.

Manual Arts Conference. The Tulsa Manual Arts Club, of Tulsa, Okla., held a manual arts conference at the Manual Arts Building, on Friday, October 30th, with Mr. C. O. Holley, of Sapulpa, acting as chairman. At this meeting, Dr. W. T. Bawden, of Tulsa, discussed "The Use of Tests in Shopwork and Drawing"; Mr. F. W. Coppedge, of Okmulgee, talked on "The Cultural Value of Woodwork," and Mr. O. B. Badger, of Oklahoma City, spoke on the subject, "Analysis of the Responsibilities and Opportunities of the Manual Arts Teacher."

(Continued on Page 25a)

Wallace
PORTABLE MACHINES

Wallace 16" Band Saw
Wallace Universal Saw
Wallace Plain Saw
Wallace 6" Jointer
Wallace 4" Planer
Wallace 6" Lathe
Wonder Spindle Sander
Wonder Disc Sander
Wallace Electric Glue Pot—Automatic Heat Control



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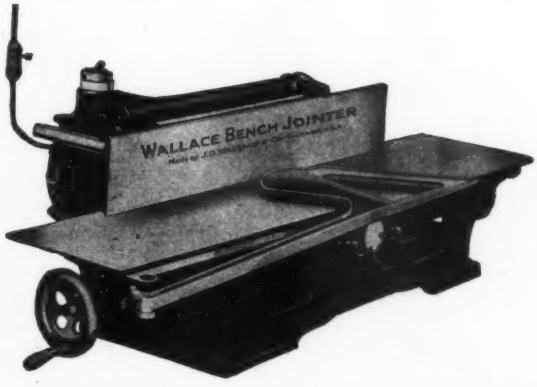

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If you are not now receiving these useful Job Sheets write us today and they will be mailed to you regularly as issued. They offer a genuine help in class routine. No. 5 sheets are now ready—a unique Decoy Duck for actual use in hunting or as an attractive toy.

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Why Do the Crack Machinists Advise the Apprentice to Start with Starrett Tools?

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Starrett Apprentice Sets (Nos. 900 and 901) give you the tools you need to start—and tools that you'll ALWAYS need. Sold by first class hardware stores everywhere at a price you can afford to pay.

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World's Greatest Toolmakers
Manufacturers of Hacksaws Unexcelled
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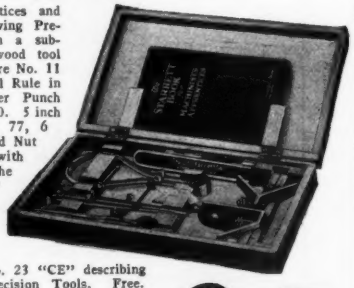
The Starrett Set for Apprentices and Students comprises the following Precision Tools neatly cased in a substantial and nicely finished wood tool box: 6 inch Combination Square No. 11 complete, 6 inch Flexible Steel Rule in Pocket Case No. 320, Center Punch No. 117-B, Center Gage No. 390. 5 inch Divider with Spring Nut No. 77, 6 inch Outside Caliper with Solid Nut No. 79, 6 inch Inside Caliper with Solid Nut No. 73. And the Starrett Book for Machinists' Apprentices (Vol. 1), 184 pages that show "how to do it."



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Maydole Carpenters' and Machinists' Hammers are the choice of leading industrial schools for the same reasons that most experienced carpenters and machinists use them—perfect balance or "hang" and a resistance to wear that makes them by far the most economical in the long run.

Ask your dealer to show you the Maydole or write us for Catalog 23 "H."

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Maydole Hammers

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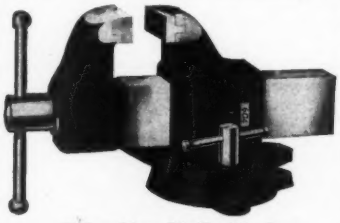
TEACH THEM ON VISES
They Will Eventually Use

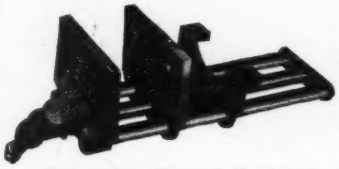
Columbian Vises on the Instructor's Bench give students an advantage when they leave school and take up their various trades.

When they go to work, they find familiar tools to work with — almost everywhere.

You can equip all departments of your school with Columbian Vises. There is a type and size for every purpose.



Columbian Malleable Iron Machinists' Vise.



Columbian Manual Training Vises.

Literature gladly sent to instructors on request.

The Columbian Hardware Company
Cleveland, Ohio

COLUMBIAN
UNIVERSAL VISES

(Continued from Page 22a)

A series of round-table meetings were held, with Mr. Shirley S. Orman, Mr. M. E. Franklin, Mr. Earl Bolles, Mr. J. H. Halderson, and Mr. V. A. Griffith in charge of the respective round tables.

During the conference opportunity was given for an inspection of the shops and drafting rooms in the manual arts building and in the basement of the Central High School. Instructors were present to explain equipment and plans of work, and to answer questions of the visitors.

The manual training department of the Hiawatha, Kansas, high school built two garages during the year for local citizens. The garages became so popular that a dozen orders followed which could not be filled. The garages are built on the school grounds and then erected where desired. During the coming year more will be built.

Industrial Club Sponsors Assembly Program. The Industrial Club of the East Chicago, Indiana, high school sponsored the assembly program and gave an unusual entertainment, with Mr. Frankenhauser, machine shop instructor, in charge. The program was broadcasted to the assembly from a distant room in the high school, over a radio set made by the shop boys. The program was very interesting and was heard plainly in all parts of the auditorium.

Lake County, Indiana, Teachers' Meeting. At the Lake County, Indiana, Teachers' Association meeting on November 6th, Mr. Denman Kelley, the new state supervisor of industrial education, spoke to the industrial section on industrial education. A committee was appointed to organize the industrial teachers and to arrange for a banquet in the near future with Mr. Kelley as the principal speaker.

Short Course in Kiln Drying of Lumber. The U. S. Forest Products Laboratory at Madison, Wis., has announced a short course in kiln drying of lumber, to be given at the laboratory from January 18th to 29th, inclusive.

Cooperative Part-Time Course. A cooperative part-time course was established at Bristol, Conn., this fall. Twenty-five boys have enrolled and there is a waiting list. During the first year, the boys will spend all of their time in school, while in the last three years, including the summer vacation, they will be employed in factories, alternating each week.

Essex County Arts Association Meets. The Essex County Arts Association of New Jersey held its regular meeting November 18th, at the Girls' Vocational School, Newark, N. J.

Funds Allotted for Vocational Guidance. Funds amounting to $15,000 have been included in the 1926 school budget of New York City for vocational guidance.

Erect New Building. A new building housing the manual training department, has been erected for the high school at Duncan, Okla. Forty-five students have enrolled for the work.

New Vocational Classes Established. Evening vocational classes in carpentry and electricity were held for the first time in November, at Joplin, Mo. Electricity and mathematics will be taught, while blueprint work, mathematics, and elementary architectural drawing will be offered in connection with carpentry.

Industrial Arts Section of West Virginia Meets. The industrial arts teachers of West Virginia held a meeting on November 6th in connection with the State Educational Association. Mr. J. R. Mulholland of Charleston, chairman, presided at the meeting, and Mr. J. C. Wright of Washington, D. C., was the principal speaker.

Other important speakers on the program were E. E. Meyers, head of the Marshall college art department who addressed the meeting on "Art and Design in Manual Training," and Professor Edward S. Maclin, of West Virginia university, who spoke on "Curriculum Making in Manual Art."

Open discussions were held on "The Educational Need in Industry," led by D. B. Finch, of the New River State Normal school; "Woodwork in the City Schools," led by E. R. Borchardt, Charleston; "Sheet Metal Work in the City Schools," led by C. J. Gould, of Huntington; "Mechanical Drawing," led by J. H. Thorp, of Charleston; and "Cabinet Making and Productive Work," led by H. A. Lightner, of Huntington. Shop demonstrations were given by W. A. Childs, of Huntington.

The Lathrop trade school at Kansas City made 2,500 stools to be used in the schools. Its printing shop did

"The most intensely practical textbook on twist drills and drilling that I have ever read," **writes one enthusiastic vocational school director.**

Points on Grinding Drills

Chapter II of the "Handbook for Drillers" deals with the tremendously important job of grinding a proper point on the business end of a twist drill.

Pointing a drill sounds easy, whereas, in reality, it is a delicate piece of work requiring the utmost knowledge and skill. Students of machine shop practice find this chapter invaluable to them in their work.

More than a quarter of a million copies of this booklet have been used as textbooks by vocational and technical schools and colleges, located all the way from Alaska to India.

Copies of the "Handbook for Drillers" will be sent in any reasonable quantities to supervisors and instructors of industrial and vocational education for use as text-books by students in machine shop practice. (No charge is made for these booklets.)

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INDUSTRIAL Arts education is progressing with astonishing significance. It has found its true place throughout the schools.

Our Art Service Bureau, well along in its third year of educational work, is answering the growing drive of art education.

Letters from everywhere ask what to teach and how to teach it. Color, design, drawing, crafts and appreciation are included in the content. The scope of service ranges from the kindergarten through the university.

Write to us, if you are in need of assistance in your work.

Our Art Service Bureau is YOUR Art Service Bureau

Send for the new Winter Outline for the first eight grades.

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41 East 42nd Street New York, N. Y.

$12,000 worth of work for the board of education. The students also built 650 tables for use in the schools, in addition to making a large number of filing cabinets, doors and window frames.

Open Classes for Plumbers' Apprentices. Classes for 70 plumbers' apprentices opened as part of the evening school conducted by the Essex County vocational board at Newark, N. J.

Will Extend Vocational Courses. With the completion of the new vocational building at Oshkosh, Wis., the school curriculum will be enlarged to include courses in the building trades such as plumbing, steamfitting, plastering, bricklaying and sheet metal. There will be courses for boys interested in farm work and a complete course in laundering, dyeing and shrinking of goods for girls.

Vocational Activities in Kansas. Foreman training has been started in Arkansas City with an enrollment of twenty students. The group meets on Thursday evenings and is directed by Lawrence Parker. Another group has been formed by E. Q. Brothers.

Superintendent J. B. Heffelfinger at Newton reports vocational classes numbering 101 students. Mr. Stauffer will lead a class in cost reading.

Three vocational evening classes are to be established at Coffeyville. E. R. Bohnert will have charge of the auto mechanics work.

Superintendent Glen A. Delay has organized some evening classes, among them one on trade mathematics. All classes are attended by employes of local industries.

Chanute claims credit of being the first in Kansas to start the vocational evening classes. J. V. Hamilton is in charge.

Superintendent R. G. Jones of the Cleveland, Ohio, schools has been authorized by the board of education to organize apprentice classes for automobile mechanics. This action was prompted by the local automobile interests.

Install New Job Press. A new 12"x18" Craftsman job press has been added to the equipment of the John A. Johnson high school in St. Paul, Minn. This school shop now has two jobbers of this size and a small cylinder. The plant has also recently been moved from a basement room to the ground floor. About fifty boys are enrolled in the printing classes, some of them specializing with the expectation of entering the trade after leaving school. Mr. John M. Guise is principal and L. F. Knowles printing instructor.

New Apprenticeship Plan. The school board of Pittsburgh, Pa., has announced the adoption of plans whereby employers of the district will cooperate with the Allegheny Vocational and Ralston industrial schools in offering theoretical training to apprentices employed in actual work.

Course in Automobile Mechanics. A course in automobile mechanics is being offered for the first time this year in the high school at Fort Madison, Ia. The course covers both the theoretical and practical phases of the subject and reimbursement will be given by the state board of vocational education.

Open Part-time School. Beginning with the fall term, a part-time school was opened at Spokane, Wash. In the school, it is planned to emphasize home making and commercial courses for girls and manual training for boys. Academic subjects will be offered as a part of the work.

Offer Shop Courses. Courses in wood-working and machine shop practice will be offered this year at the Nottingham and Roosevelt junior high schools, Syracuse, N. Y. New equipment in the way of circle saw, jointers and mortising machines have been provided.

Practical Vocational Work. Sales of cake and pastry, commercial catering and the making of a bride's trousseau were examples of practical vocational work carried out by students in the technical high school at Buffalo, N. Y. The class in trade dressmaking during the year turned out 200 gowns, blouses and skirts for customers.

Vocational Aid for Pupils. The board of superintendents of New York City has approved a plan for three vocational counsellors to be employed in six junior high schools, and two additional ones to be employed in continuation schools, at compensation at the rate of $1,900 a year for each counsellor. The recommendation was made after careful consideration of the general plan and personal knowledge of the work done by a committee on vocational service for juniors in a five-year demonstration of the work.

MILTON BRADLEY

Educational Service

THE MB SIGN

To the great army of Art Instructors, who are giving their best efforts to the advancement of elementary training, we extend our New Year's Greetings and the right hand of fellowship.

NOT least among the compensations of this organization is the knowledge that we are working with the makers of the nation. It is impossible to overestimate the importance of foundation building in modern education, and all honor should be accorded to the conscientious instructors who are molding the immature minds.

SO extensive are the ramifications of this company, that we touch the educational process at every turn; but it is in the school arts field that we concentrate our greatest efforts. As a result, there are few elementary schools which are not regular users of our products.

ALTHOUGH it is necessary that most school supplies should be very moderately priced, none of the Milton Bradley Co. items are slighted in workmanship or the materials entering into the construction. They are always serviceable and perfectly adapted to the purpose for which they were created.

WE desire to count every Art Instructor as a friend and fellow-worker. Suggestions or criticisms are always welcomed from those on the "firing line." If you think it possible to improve any item of the Bradley Line, write and tell us how it may be done. We maintain our prestige in this field by constantly progressing.

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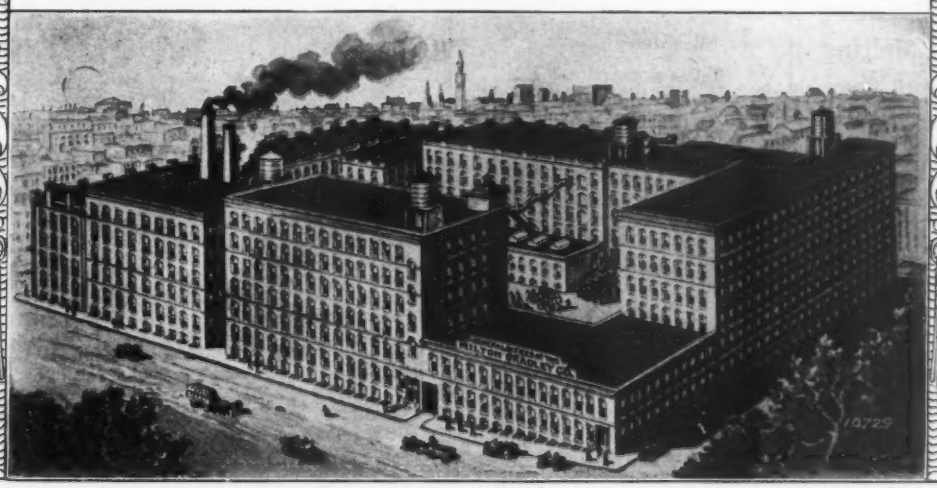

PEXTO GUIDE No. 25A

Free for the Asking—

SHEET METAL WORK—as an Industry—its Value as a timely Industrial Vocation for School Shops — the Projects — Aims of the Course — Sheet Metal Working Machinery — Application, and other things you would like to know are fully covered.

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The work is healthful, the hours short, and pay ranks high among the best paid trades.

The initial equipment required costs far less than any other equipment you could install considering the results obtained. The supplies necessary to carry on the course cost very little.

We will be glad to furnish an estimate on sufficient machines and tools to cover your needs upon receipt of number of pupils to be taught.

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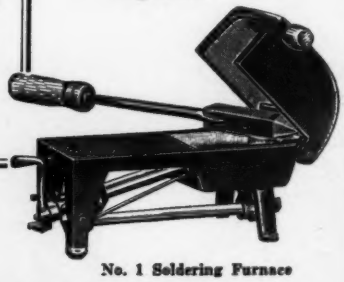
Do All Your Soldering Heat-Treating Metal-Melting Without the Use of a Blower!

Johnson Furnaces produce more heat quicker, with less gas, due to the Johnson Patented Direct Jet Regulator.



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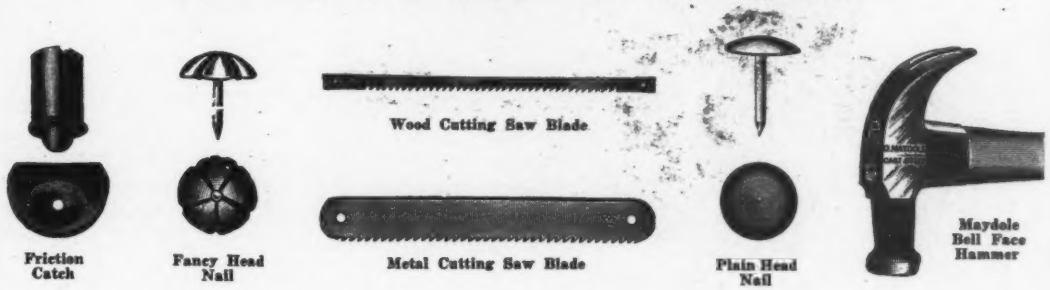
helpful in selecting Tools, Materials and Supplies generally used in vocational work. This book is sent gratis upon written request naming your school and position.



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School Equipment of Tools, Materials and Supplies

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PERSONAL NEWS

Mr. Merritt W. Haynes, formerly educational director of the United Typothetae of America, has been employed by the American Type Founders Co., of Jersey City, N. J., as director of educational research. Mr. Haynes will devote his time to research activities, applied to instruction in printing, in the interest of the printing industry, and the schools and institutions.

Mr. Wm. R. Baker, formerly located at Sioux City, Ia., is now in charge of publications and printing in the Waukegan Township Secondary Schools at Waukegan, Ill.

MERRITT W. HAYNES,
Chicago, Ill.

Mr. Kimbrel has been appointed painting instructor in the David Ranken School of Mechanical Trades, St. Louis, to succeed the late Mr. Lehman. Mr. Kimbrel is a graduate of the school and was formerly an interior decorator.

Miss Rose Marie Corrigan has been appointed assistant drawing supervisor for the public schools of Taunton, Mass.

Mr. Harold N. Young of St. Johnsbury, Vt., has been appointed as manual training instructor at Holyoke, Mass.

Mr. C. G. Sharkey, principal of the vocational school at Dayton, O., has been appointed vocational director of the free night school.

Mr. R. F. Troge has been appointed head of the industrial department at the Memorial Junior High School, San Diego, Calif. Mr. Troge is well qualified for his work, having been supervisor of industrial arts at Aberdeen, South Dakota, for several years.

Mr. Alfred Sorenson, for a number of years instructor in commercial work and coordinator in the Berkeley, Calif., part-time school, has accepted a position in the University High School, as head of the commercial department.

Mr. G. C. Mann of Arizona, has been named as the new director of vocational education and principal of the part-time school, at Berkeley, Calif. Mr. Mann succeeds George B. Edwards, whose death was recently announced.

Mr. Julian A. McPhee of Gilroy, Calif., has entered upon his duties as assistant to State Supervisor Richard J. Werner in the department of agriculture. Mr. McPhee will visit the schools having agricultural departments, and will assist in the various conferences which are held in many parts of the state.

Mr. Howard A. Campion, for the last two years assistant supervisor of classes for trade and industrial teachers at the Southern branch of the University of California, has been made principal of the Frank Wiggins Trade School, at Los Angeles.

Mr. E. E. Weaver has become principal of the Kansas Vocational School, succeeding G. R. Bridgeforth. Mr. E. L. Burke, formerly carpentry instructor, is now director of the vocational work. The school is offering vocational work in the subjects of auto mechanics, tailoring, and carpentry.

Mr. J. B. Yingling, director of vocational education for the public schools of Wichita, Kans., recently completed work for a master's degree at Harvard University. A part of the work consisted of making surveys of industrial plants in Boston.

Mr. Harry McGinnis, director of industrial education at Coffeyville, Kans., has completed the program for evening classes during the winter months.

Mr. J. L. Walker, instructor of shop mathematics at Coffeyville, Kans., during the past winter, has completed work for his degree in vocational education.

Mrs. Lucille Rust has taken up her duties as teacher-trainer in vocational home making at the Kansas Agricultural College, Manhattan, succeeding Miss Maude Williamson.

Mr. H. M. Brook of the Central High School, Minneapolis, has been elected state supervisor of trades and industries of Iowa, succeeding Mr. Harvey L. Freeland, who has gone into normal school work.

George E. Hutcherson has been appointed supervisor of industrial arts education for the New York State Department of Education, succeeding Leon L. Winslow, who resigned in September, 1924. He will have supervision of the non-vocational industrial courses in the grades and high schools of the state. Mr. Hutcherson was graduated from Teachers College, Columbia University, and has had supervision of the practice teaching of students in training in the industrial teacher-training department of the Oswego Normal School. He taught industrial subjects for six years before entering Teachers College.

BISON BRAND GLUE

100% Adhesiveness

A superior adhesive manufactured by the same process as Pure Food Gelatine, under ideal climatic conditions. This process, and the careful selection of raw material, yields a glue of 100% adhesive matter.

The most vital consideration in buying glue is its keeping properties. The BISON BRAND being 100% pure, its keeping properties are guaranteed.

The unusual adhesive strength and penetrating qualities make it an ideal glue for all requirements of the woodworking industry and school shops.

Uniformity is guaranteed.

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NEW BOOKS

Construction Drawing

By Joseph Brahdy and Samuel Landsman. Cloth, 133 pages, illustrated. Price, $2.50. Published by D. Van Nostrand Co., New York City.

This is a beginner's text for high school students who major in architectural drawing preparatory to entering one of the building trades, or an architect's office. It affords a very broad course for the young students to whom it is addressed and carries them along to a complete study of a six room house of hollow-tile construction.

The student is introduced to the fundamentals of drawing as a language by four exceptionally well written chapters in which all the important fundamentals—orthographic projection, the scale of drawings, sections and hidden lines, lettering, conventions, etc.—are fully described and splendidly illustrated. The actual architectural drawing begins with construction drawings for a freight platform or a trolley platform and proceeds by easy stages to the drawing of a field office, a sun-porch, a bungalow, several garages, a five room colonial cottage, and finally a tile house.

Principles of drawing and construction are developed simultaneously, are illustrated by the problems, and are thus introduced naturally when they are needed. The emphasis at first is entirely on tools, technique, and drawing processes, but is rapidly shifted to construction and planning as the student advances beyond the first problem to the more important types of buildings. Ample teaching aids in the way of illustrations, related information, oral quizzes, and supplementary problems are included to vitalize the course and to adapt it to the most rapid as well as slower students. Good design and good construction are emphasized.

Here in the middle West several of the construction suggestions vary from common practice. Few builders would build a field office with quite such stout framing, and, except in districts where stone is exceptionally plentiful would a stone wall be used as a garage foundation. The authors have undoubtedly followed local practice. Alternate constructions could be introduced in the book with little trouble.

Linoleum Block Printing

By Charles W. Smith. Boards, 64 pages, illustrated. Price, $3.00. Published by Charles W. Smith, 11 North 8th Street, Richmond, Va.

This book is addressed to printers and craftsmen—artists who have some experience in printing. It takes up the processes, materials, and tools of cutting and printing linoleum blocks in a brief, general way rather than in an exact, complete and detailed textbook style. The author is a printer, an expert linoleum block cutter, and a good artist with excellent ability in composition andd design and a fine sense of color values. The present book is proof of his abilities in all three directions and the block prints with which he illustrates the work are as beautiful a little collection of work as we have seen. It would be most intesting to have the book expanded to meet the needs of printing and art teachers for a text on linoleum block cutting.

Instruction Manual for Sheet Metal Workers

By R. W. Selvidge and E. W. Christy. Cloth, 167 pages. Price, $1.20. Manual Arts Press, Peoria, Ill.

This book is largely the result of the senior author's service in the army training camps during the recent war. The sheet metal trade is broken up here into 38 unit operations or processes and exact directions are given, in the form of instruction sheets, for performing the operations. No application to actual jobs is given—the book confines itself to processes only—and the instructor is expected to provide the necessary jobs and job sheets for applying the operations.

Supplementary sections of the book contain information on materials, tools, and mathematics of the trade. A complete series of standard tables for sheet metal and heating trades closes the book.

The book will appeal chiefly for its wide adaptability to unit courses for tradesmen, as well as for trade schools and continuation schools where courses and shop conditions vary in the extreme.

A Comparison—English Composition and Printing Composition. Some notes on teaching composition and type composition. Printed and issued by the Cass Technical High School Print Shop, Detroit, Mich.

PICTORIAL AND WRITTEN PROOF

Of Value In

ART-FIBRE FURNITURE WEAVING

Voluntary Testimonials Bear Out Oft Repeated Claims That Art-Fibre Furniture Weaving Does Have a Definite Place in the Manual Training Department

FIRST YEAR WORK IN ART-FIBRE FURNITURE WEAVING

Chair project in process of construction at Lexington Public Schools, Lexington, Kentucky; Mary T. Brown, Manual Training Instructor.

Art-Fibre Weaving can be taught to all grades from the sixth up. There are projects suitable for all ages commensurate with the pupil's ability. The same supervision will suffice because the fundamental principles are the same and the same weaves are used.

GRAND RAPIDS FIBRE CORD CO.,
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Gentlemen:—

Long before furniture weaving was attempted in classes generally I organized my first class. I found some difficulty in holding a class in basketry; this was true because few people cared for more than a couple of baskets. In the furniture weaving class I found the opposite to be the case. The class was always over-crowded and at one time we had 200 enrolled.

Certainly Art-Fibre Cord has no equal for weaving and is most suitable for work in the lower grades. The boys in the lower grades lack the necessary muscular control to do effective tool work. If a piece of wood is planed too much it is spoiled and must be thrown away. If a piece of weaving is poorly done the Art-Fibre Stakes may be straightened, the weaving taken out and re-woven with no waste of material. There is also a development of the artistic faculties of the boy which is hard to obtain through wood working. I have used many hundreds of pounds of your product and will continue to use it so long as I am a teacher of furniture weaving.

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FROM ART-FIBRE WEAVING
LET US HELP YOU GET STARTED

Our complete material supply service and new text-book on furniture weaving and finishing makes it easy to start and maintain classes. We can supply all materials for weaving more than 100 furniture weaving projects.

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Sharpen Edge Tools
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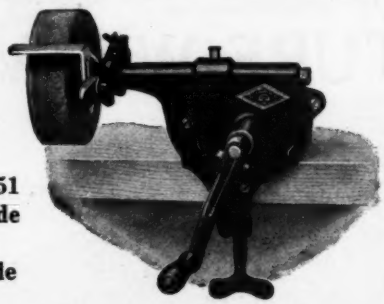

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Manual training instructors, skilled mechanics, carpenters and pattern makers have found that Luther Grinders are the safest and most practical tool grinders made—excellent design and workmanship—a real quality product.

Grinder illustrated is our No. 51 Best Maide, ball bearing, swivel type hand grinder, equipped with combination (medium and fine) grinding wheel, especially adapted for grinding edge tools. No. 51 is equipped with 5x1½x⅞" DIMO GRIT grinding wheel and plain tool rest.

A special chisel and plane bit holding attachment can be furnished — insures uniform, accurate hollow ground bevel always.

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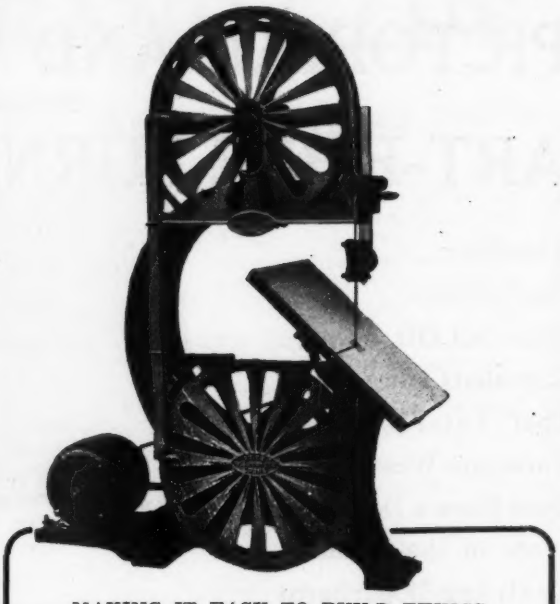

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The 14" Boice-Crane Bench Band Saw pictured above is accurate and sturdy. Cuts fancy curves, or rips rapidly. Makes it easy to build things. Table Tilts 45 degrees. Has Ball-Bearing Roller Guide. Takes blades ⅛ to ½ inches wide. Sold with or without motor, and guards.

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And, too, when the student leaves school and enters industry, he will more than likely find Sterling machines and wheels in use and his practical work will be all the more familiar to him.

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"This vise is like a bulldog—it never lets go."

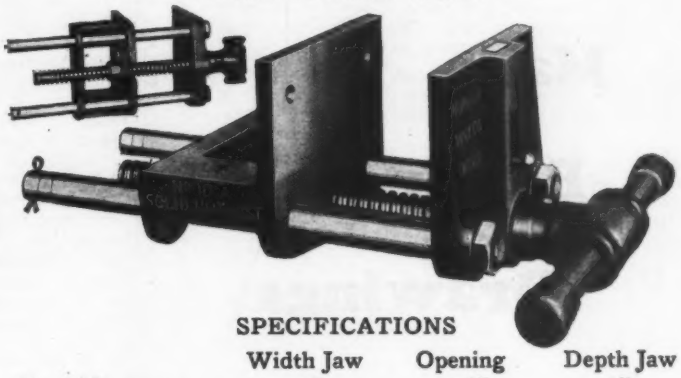
Replace your old style equipment with these vises and eliminate the expense and annoyance of repairs.

THIS IS THE VISE!

Note the simplicity of construction.

Built to withstand the severest use and abuse.

The EXTRA HEAVY STEEL SCREW accurately fitted to the SOLID BRONZE NUT (with its long bearing surface) insures smooth and rapid operation and reduces wear to a minimum.



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	Width Jaw	Opening	Depth Jaw
No. 10A.....	7″	8½″	4″
No. 20A.....	10″	12″	4″

No. 10A can be furnished with 12″ opening.

Write for prices and our unqualified guarantee.

MORGAN VISE CO., 558 Washington Boulevard, CHICAGO

TRADE PUBLICATIONS

Issue Annual Catalog of Manual Training Supplies. The Thurston Manual Training Supply Co. of Anoka, Minn., has issued its eleventh annual catalog of hard-to-get materials for the year 1925-1926. The catalog offers a most complete line of supplies for schools and manual training instructors, including materials for upholstery work, leather, mirror, lamp shades, picture mouldings, decalcomania transfers, cedar chest trimmings and hardware, tea wagon wheels, table tops, chair cane, birch dowels, wood finishing supplies, glues, cabinet hardware, extension table slides, and phonograph hardware. All materials and supplies are illustrated and described and carefully priced. A copy of the catalog will be sent to any shop instructor who requests it.

Catalog of Electrical Books. The McGraw-Hill Book Company, New York City, N. Y., has just issued a special catalog of books on electrical engineering including all of the splendid list of recent electrical books published by the firm. Copies of the catalog will be sent to any teacher on request.

Every Day Art. The November Issue of Every Day Art, published by the American Crayon Company, Sandusky, Ohio, contains valuable papers on the use of opaque colors by John T. Lemos, and on the strengthening of the foundation of school art by W. C. Knouff.

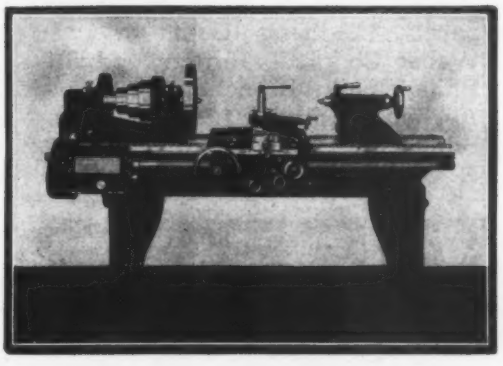
Issue Interesting Booklet. The Simonds Saw and Steel Company of Fitchburg, Mass., has just issued a new use and selection of Hack Saw Blades and also methods of hints of value to vocational educators and manual training bookklet entitled "Hacksaw-ology," which deals with the cutting metal. The booklet not only contains many useful teacher-trainer in the School of Agricultural Education directors, especially those teaching metal working, but it is just as valuable to the pupil in shop practice.

Besides outlining methods for using power Hack Saw Blades, it also deals clearly in non-technical terms on the various operations of the hand Hack Saw Blade. How to select the proper blade for different kinds of metal cutting, the number of teeth best adapted, and the care and general use of the Hack Saw are other details fully explained.

This booklet is printed on excellent paper and arranged for ready reference. It contains charts showing the right blades and number of teeth for most efficient metal cutting. As an addition to the usual textbooks, this new Simonds booklet is of much value. Free copies of Hacksaw-ology will be sent on request to directors and instructors of manual training, sheet metal, etc.

NEW TRADE PRODUCTS

New Line of South Bend Lathes. The South Bend Lathe Works, South Bend, Ind., has just issued a bulletin completely describing the new thirteen-inch South Bend Lathe. This new lathe has power for manufacturing, insures accuracy for precision tool-making, and has capacity for a wide variety of general machine work. The lathe parts are machined on special machines fitted with jigs and fixtures to insure accuracy and interchangeability.



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Weber Papers Make Better Drawings

Recommend drawing paper with the same care that you recommend instruments. Paper can do much to help or hinder the appearance of your pupils' work.

Weber Drawing Papers are ideal for the classroom. They have a strong, tough, durable texture. They have a finish that allows a maximum of erasing without the slightest danger of smearing or blotting. Made in a number of weights and textures, there is a Weber Paper suited to every purpose.

Help your students to turn out sharp, clean art work by recommending Weber Papers. Write for sample book of these wonderful papers. Address Dept. I.A., F. Weber Co., 1220 Buttonwood St., Philadelphia. Branches: 227 Park Avenue, Baltimore, 125 So. 12th St., Philadelphia, 705 Pine St., St. Louis.

WEBER

Drawing Instruments & Materials

The bed of the lathe is of heavy semi-steel casting, rigidly braced by internal U-shaped cross girts, placed at short intervals its entire length. It is roughplaned and thoroughly seasoned, and is provided with generous bearing surfaces for the saddle. The head stock and tail stock are aligned on the inner V and flat way.

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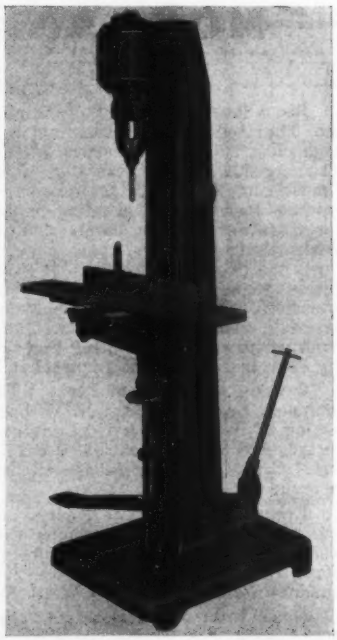

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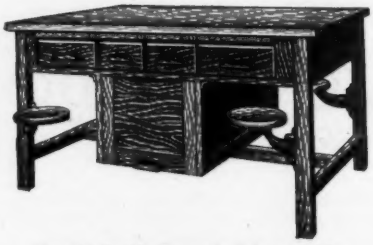

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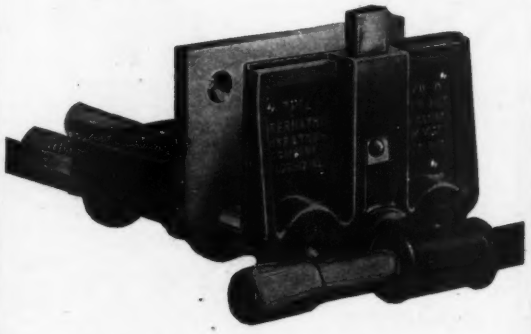

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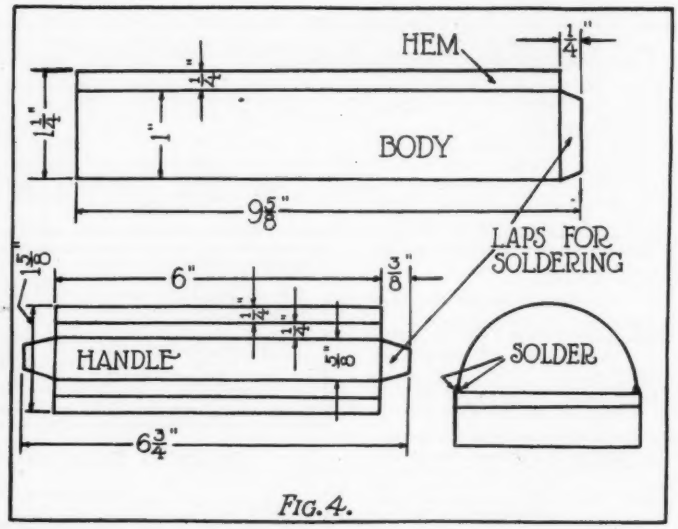

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Monarch Machine Tool Company
Oliver Machinery Co.
Seneca Falls Machine Company
South Bend Lathe Works
Steptoe Co., The John

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Greenfield Tap & Die Corporation
Hall & Brown Woodworking Mach. Co.
Little Giant Company
Oliver Machinery Company
Sebastian Lathe Company
Seneca Falls Machine Company
Sidney Machine Tool Company
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Stanley Works
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Cal. White & Sugar Pine Mfrs. Ass'n
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Disston & Sons, Inc., Henry
Hall & Brown Wdwkg. Mach. Co.
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Simonds Saw & Steel Co.

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Greenfield Tap & Die Corp.

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Oliver Machinery Company
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Stanley Works, The
Starrett Company, The L. S.

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Weber Company, F.

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The ELDORADO PAGE

Sketching with "the master drawing pencil"

Banqueting Hall
Haddon Hall

Notation of Procedure

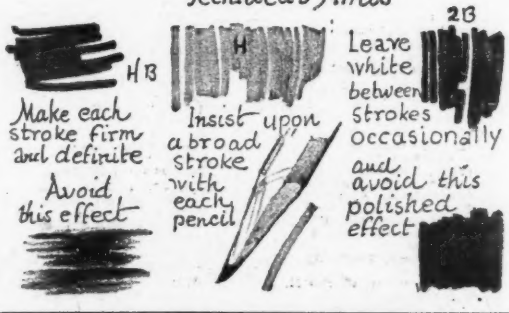
ACCURATE layout in light outline. This is important, as it assures a comfortable freedom from concern over drawing when rendering is in progress.

Sketch rendered as follows: Dark panelling under window, then up left side using 3B Eldorado. Window mullions with 2B. Panelling of partition and balcony with HB and H. Floor toned with HB. Plastered wall with 2H. Arched door with H.

In rendering the panelling, the framework was first laid in, then the panels toned. Some cross hatching on panels.

In rendering plaster, direction of strokes changed freely. No structural reason for any particular direction. Effect of halation imitated by streaks of light across window and panelling done with an eraser, also by indefinite indication of leads of window. Note white accents left in tones frequently throughout sketch. They give sparkle.

Technical Hints


HB
Make each stroke firm and definite
Avoid this effect
H
Insist upon a broad stroke with each pencil
2B
Leave white between strokes occasionally and avoid this polished effect

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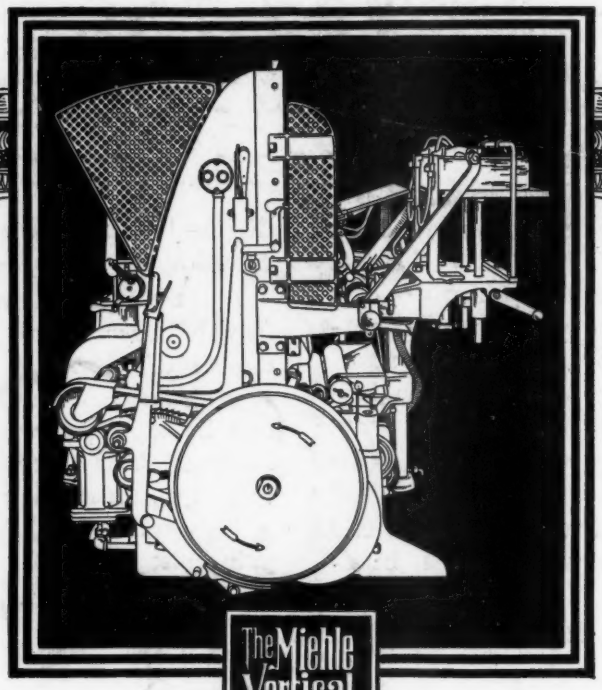

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